PRICE 50 CENTS

American Machinist

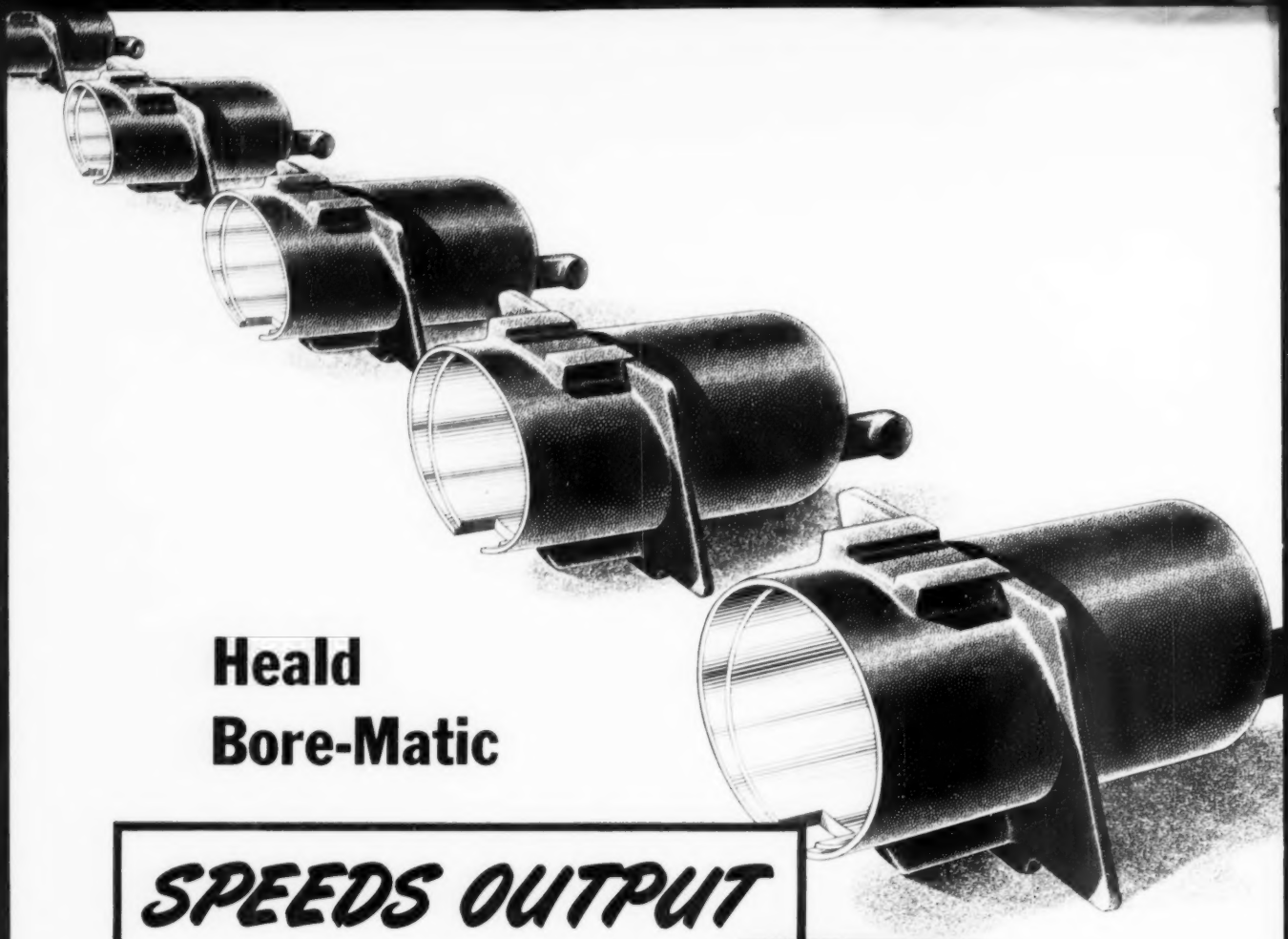
DECEMBER 7, 1953

THE MCGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

Jet-wheel broach has 180-in. stroke
— see page 2

Chain-Gang Your Assembly

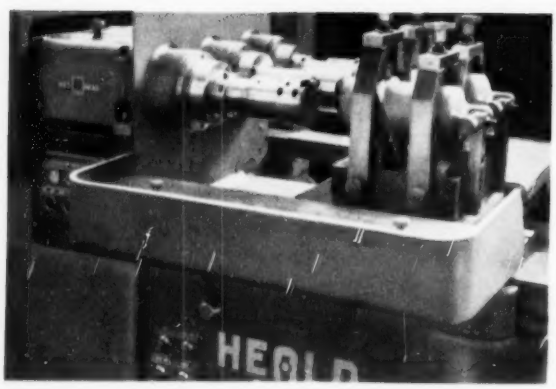
Custom-Made Precision Enclosures—A SPECIAL REPORT



Heald Bore-Matic

SPEEDS OUTPUT

of ironer cylinders 67%



• WHEN YOU COMBINE high cycle speeds, multiple boringheads and automatic indexing, you'll get faster, better production every time. The Heald Model 321 Bore-Matic shown at the left is a typical example.

By performing both roughing and finishing operations on two parts at a single loading, this machine speeded up the job by 67%. Three boringheads are used — the outer two for roughing the cast iron cylinders, and the center one for the finishing operation. A two station fixture on the cross slide indexes the work automatically. Parts are located in a Vee block fixture, with quick-acting clamps for easy loading and unloading.

Remember — when it comes to precision finishing, it pays to come to Heald.

Internal and Rotary
Surface Grinding Machines
and Bore-Matics

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WORCESTER 6, MASSACHUSETTS

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MAGAZINE OF METALWORKING PRODUCTION

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ABC ABP

chips

LONG-STROKE BROACH . . . Turbine and compressor wheels of gas-turbine engines at Pratt Whitney Aircraft are slot-broached on the periphery for insertion of blades. Broaching is done with the broach on our cover, a 180-in. stroke, single-ram, horizontal, electric-drive unit. Made by Lapointe for the past year, the machine has a dc motor coupled through a gear reducer to herringbone and spiral-bevel-gear drives, and is extremely massive, both done to avoid pulsation or vibration. Speed is stepped up to 80-100 fpm with HSS tools for tough materials, and up to 200 fpm with carbides. Such a machine makes it possible to broach a disk in one continuous pass, thus avoiding the work hardening that occurs if gutting and forming are done separately.

ASSEMBLY AUTOMATION . . . Delco Remy has automated assembly with a standardized machine that indexes a carrier chain around its periphery at a predetermined rate and length of travel. Fixtures on the chain stop at stations where there may be a riveter, saw, milling head, welder, or other unit to add a part or perform an operation. The same principle may be used in machining, of course, and gives large output in small space. Our lead article, this is another in the *AM* pioneering series on automation.

CUSTOM ENCLOSURES . . . For several months, we've been intending to bring you details on the methods of making precision metal enclosures used by Karp Metal Products Co in Brooklyn. It's a matter of following three basic principles: 1. Versatility in tooling and machines. 2. Ingenuity combined with minimum tooling. 3. Smart production techniques. We teamed two associate editors, Emerson and Wright, to bring you pictured ideas as our current Special Report.

GRINDING . . . We have two stories on grinding for you, sharply contrasting in product and operation. First, there are the special traveling-head grinders that lick the job of close finishing of welded armor plate that varies in hardness. The product is tank hulls, and John Horth, chief engineer of Mercury Engrg Co, and C E Stevens, general manager of Bengston, Inc, tell you all about it. . . . Second, C I Wallace of U S Hoffman tells of the problems faced by Electric Auto-Lite in thread-grinding windshield-wiper motor shafts.

DUCTILE-IRON DIES . . . State Foundry & Machine Co, Cedar Rapids, Ia, is using heat-treated ductile-iron dies in forming 20-mm brass cartridge cases. Die life on one operation is 18 times better than with tool steel. Ductile iron is also working well in crankshafts for the header on the job, says J C Neemes, Jr, of International Nickel.

MERIT INSPECTION . . . G H Prudden of Lockheed explains a tricky principle in use there—making each man his own inspector—but on a merit basis. Each department is responsible for control of its own product quality—when, and as long as, it deserves to be. Substantial cost reductions have resulted.

COMING . . . *AM* for Dec 21 will have another in the series of Sam Storchheim's reports, this one on understanding aluminum and its alloys. The lead story will cover high-temperature ceramics, and there'll be articles on heat truing, bore grinding and die design.

NO. 1 MAN . . . George H Prudden has many aircraft "firsts" to his credit, including use of chrome-moly steel, of pneumatic riveters, of the drop hammer, and a number of design ideas. He built his first airplane in 1910, learned to fly by himself, was chief engineer of Stout Metal Airplane Co in 1920 when he designed and built the first all-metal airplane and the Ford Tri-motor. He designed the Ford Airport and Lindbergh Field, too, was with Lockheed from 1932-1940; works manager with Vega 1940-46 and in his present position with Lockheed since that time. Our current issue tells how Lockheed has changed its inspection system.

for the first time . . .

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DISC-TYPE CUTTERS
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Newly developed to generate better bevel gears and pinions *faster* at lower cost. Cuts many sizes with minimum set-up time, few cutters. Cam-actuated generating roll insures maximum efficiency in the cutting cycle. Ideal for volume or short-run production.

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BUILDERS OF BEVEL GEAR MACHINERY FOR OVER 85 YEARS
1000 UNIVERSITY AVE. • ROCHESTER 3, NEW YORK

business forecast for this Cincinnati grinder:

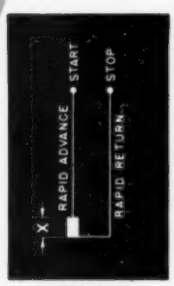
Production UP

Cost and Operator Effort DOWN

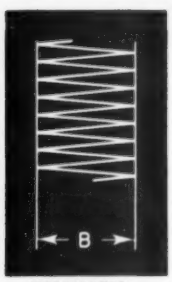
Goal for low-cost operation of metalworking shops . . . when you increase production, reduce cost and worker fatigue. How this desirable result was attained for a production centertype grinding operation is illustrated here: a CINCINNATI FILMATIC 10" x 36" Plain Hydraulic Grinder equipped with automatic features. ¶First, there's the *automatic infeed attachment*, for infeed grinding operations. It reduces fatigue and aids production by doing several things for the operator: rapid advance wheel to work, grind, spark-out to size, rapid retract wheelhead. Secondly, the *hydraulic footstock* advances and retracts the work center automatically, relieving the operator of this onerous chore twice for each part ground. *Automatic grinding wheel spindle reciprocating attachment* improves finish on the work without undue operator attention. Two standard machine features . . . FILMATIC grinding wheel spindle bearings and automatic coolant and headstock control . . . contribute their share to the advantages of automaticity attained on this job. Of course, CINCINNATI FILMATIC Plain Hydraulic Grinders offer other advantages that will give a rosier hue to your "business forecast" for precision centertype grinding. ¶You will find brief data in Sweet's Machine Tool Catalog. Complete information may be obtained by writing for our publication No. G-603.

CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO
(Subsidiary of The Cincinnati Milling Machine Co.)

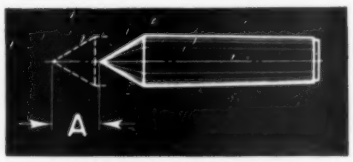
CINCINNATI



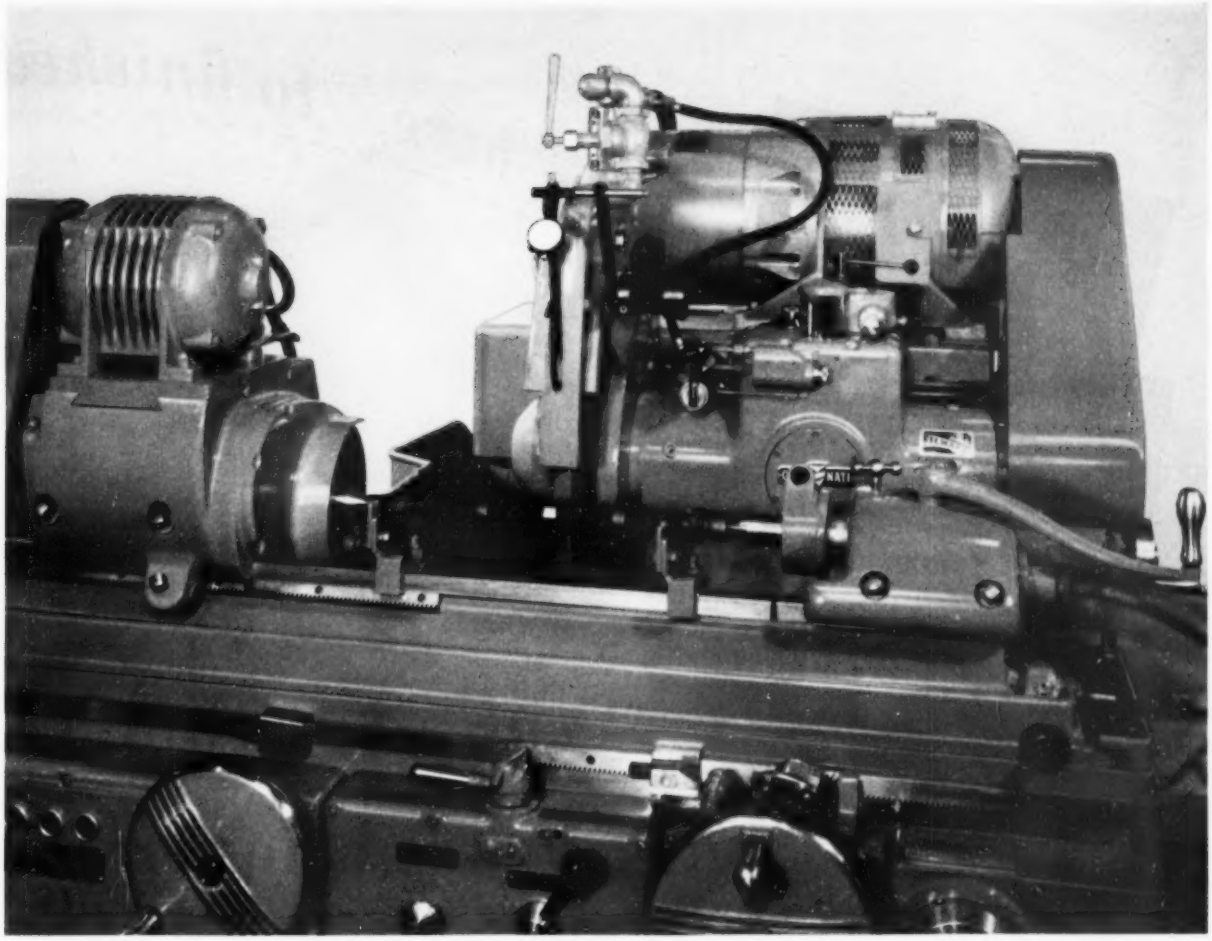
AUTOMATIC INFEED
X = Stock removal, adjustable from 0 to .030".

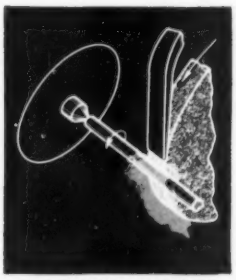


AUTOMATIC SPINDLE RECIPROCATION
B = Stroke, adjustable from 1/32" to 3/16".



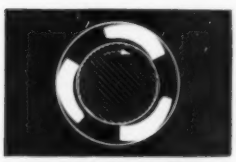
HYDRAULIC FOOTSTOCK
A = Automatic advance and retraction of footstock spindle.





AUTOMATIC COOLANT AND HEADSTOCK CONTROL

Work rotation and coolant automatically start and stop. Standard feature.

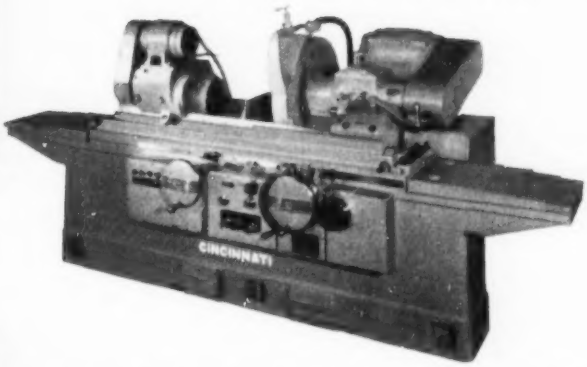


FILMATIC GRINDING WHEEL SPINDLE BEARINGS

Automatically adjust themselves for amount and direction of load.

FILMATIC

Drawing of camshaft ground on the CINCINNATI FILMATIC 10" Plain Hydraulic Grinder illustrated here. Heavy line indicates ground surface.



CINCINNATI FILMATIC 10" x 36" Plain Hydraulic Grinding machine. Catalog No. G-603.

CINCINNATI

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36 Type Gear Shaper Cuts Production Time

Fewer Machines... Greater Accuracy... Lower Costs... these are the results in a plant where two modern 36-Type Fellows Gear Shapers are doing the work of *five* ordinary machines in cutting the spur gears specified in the production chart at the right... producing more work of greater accuracy and cutting operating costs into the bargain.

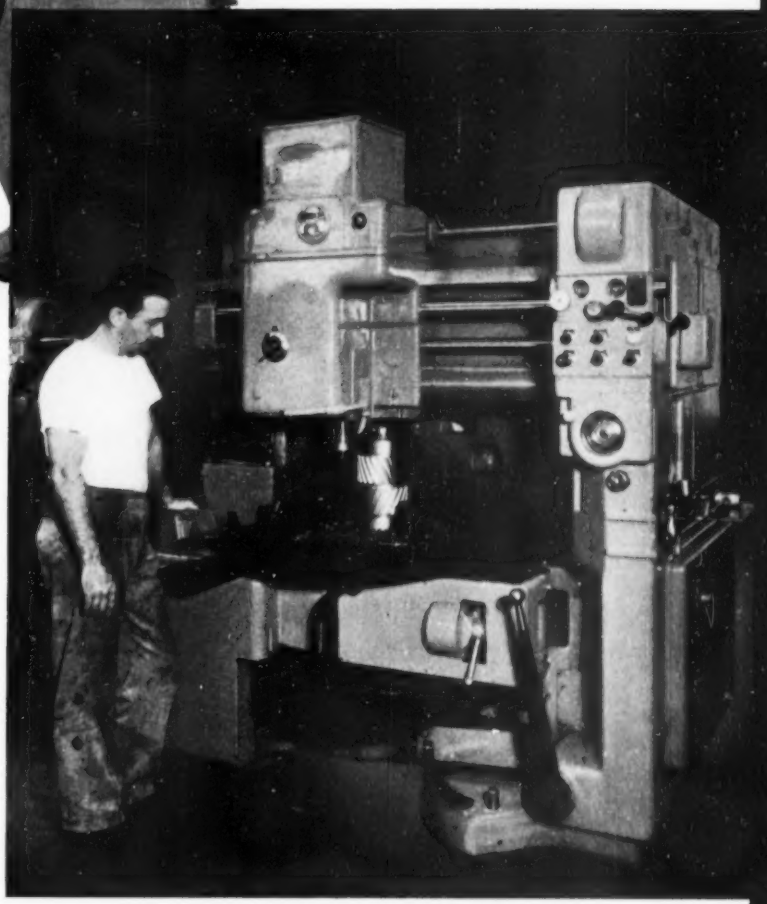
The 36-Type can be adapted to a wide range of work... spur or helical gears, external or internal, herringbone gears as shown in the illustration, splines, and irregular shapes of all sizes up to and including 36" pitch diameter and 6" face width. All these can be generated on this Gear Shaper by the Fellows Method.

You can find out what the 36-Type Gear Shaper can do in your plant by talking with a Fellows Representative.

Fellows

The FELLOWS METHOD
...in action!

gear



By 65%

PRODUCTION PERFORMANCE

LARGE BRONZE SPUR GEAR (TOP)

Material . . . . . High tensile bronze #3
Face width . . . . 4 inches
Pitch diameter . . 34.000 inches (Special)
No. of teeth 138
Diametral pitch . 4
Production Time . 6 hours

Production Time with 36-Type Gear Shaper . . . 1 hr., 55 min.

STEEL SPUR GEAR

Material . . . . . Steel casting DW-19
Face width . . . . 3 inches
Pitch diameter . . 22.250 inches
No. of teeth 89
Diametral pitch . 4
Production Time . 10 hours

Production Time with 36-Type Gear Shaper . . . 2½ hours

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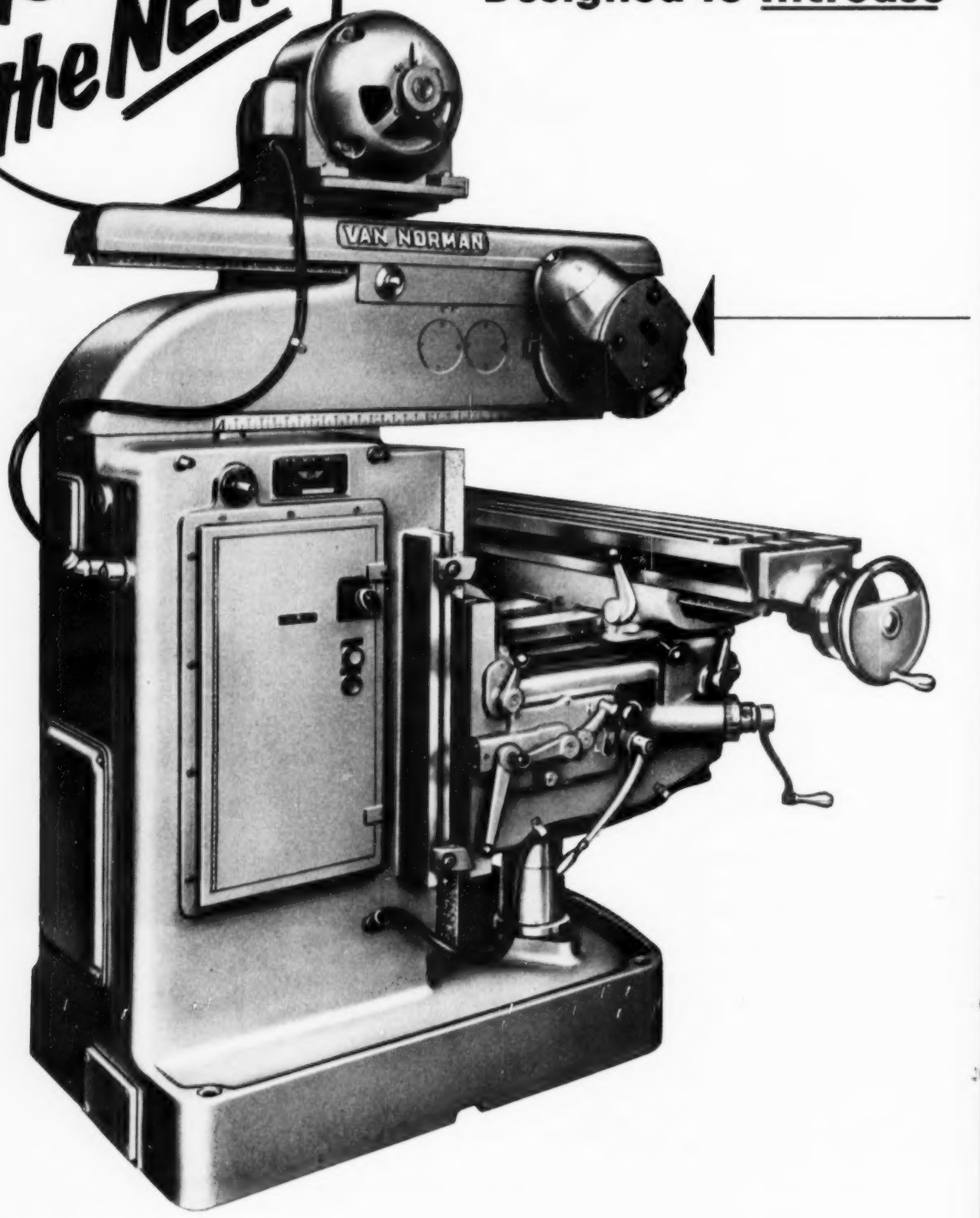
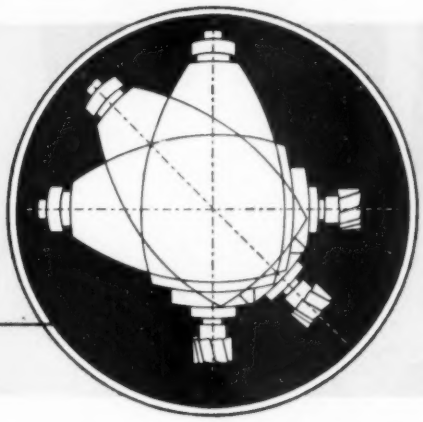
Designed to Increase



No. 24M Ram-Type Miller

Productivity and Lower Milling Costs!



Featuring the Adjustable Cutterhead that permits Horizontal, Angular or Vertical Milling with ONE machine ...reduces work reset-ups, cuts idle machine time... **UP TO 50%**

Plus These Additional Production Increasing Advantages

★ *New Extended, Heavy-Duty Ram* permits maximum cuts over entire ram range . . . increases capacity of the miller. Ram movement, in and out over column, 25".

★ *New Improved Cutterhead* has 90° adjustment. Increases the versatility of the miller.

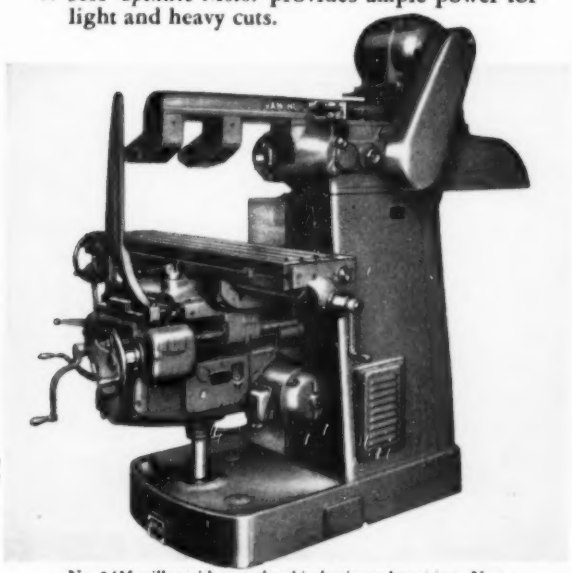
★ *3HP Spindle Motor* provides ample power for light and heavy cuts.

★ *New Direct Drive Feed Motor* mounted on side of knee.

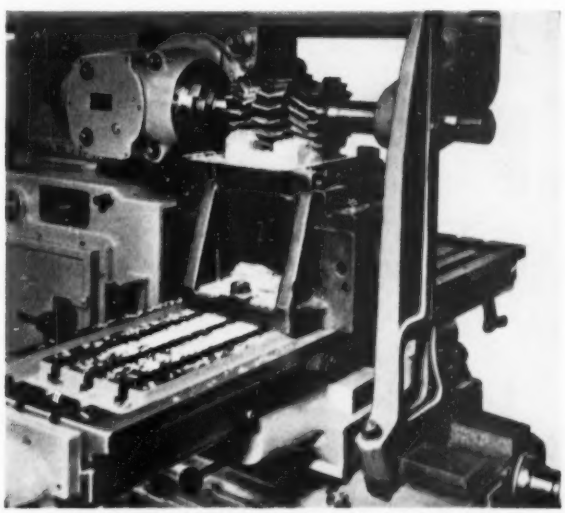
★ *Front and Rear* Controls of power and manual feeds for ease of operation.

★ *New Enclosed Elevating Screw* assures long life.

★ Write for Catalog describing the new Van Norman No. 24M Milling Machine in detail.



No. 24M miller with cutterhead in horizontal position. New direct drive feed motor mounted on knee.

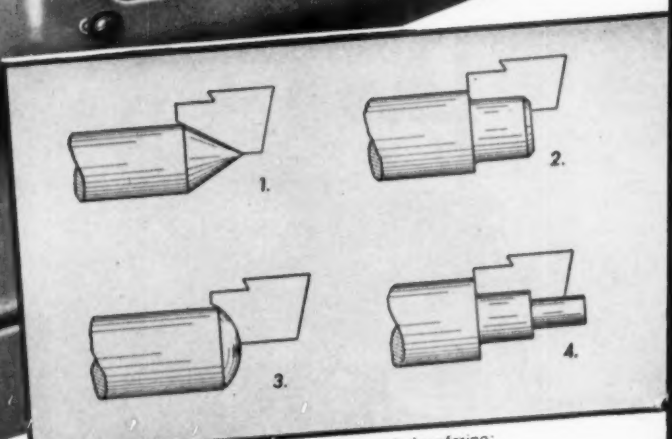


A heavy horizontal milling cut being performed on the 24M.

VAN NORMAN COMPANY

SPRINGFIELD 7, MASSACHUSETTS

low Extra



1. For a full or partial point; 2. For turning and chamfering; 3. For a radius form; 4. For different cuts on two diameters.

50th ANNIVERSARY

THE WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF THREAD GENERATING EQUIPMENT

Milling LANDIS Feature

LANDIS Die Heads, in addition to conventional threading operations, can be equipped with LANDIS Turning Cutters which will perform turning, grooving, forming, and facing by the hollow milling method. Milling operations may be performed by LANDIS Heads applied to automatic screw machines, turret lathes, or LANDIS leadscrew-type or hydraulic-feed threading machines, and other positive-feed-type machines.

Many Production Advantages

Hollow milling by this method offers an increased efficiency occasioned by the application of a multiple number of cutting tools. The feed rate is thus approximately equal to that of a single tool, multiplied by the number of simultaneously-functioning cutters in the unit—four or six for LANDIS Heads.

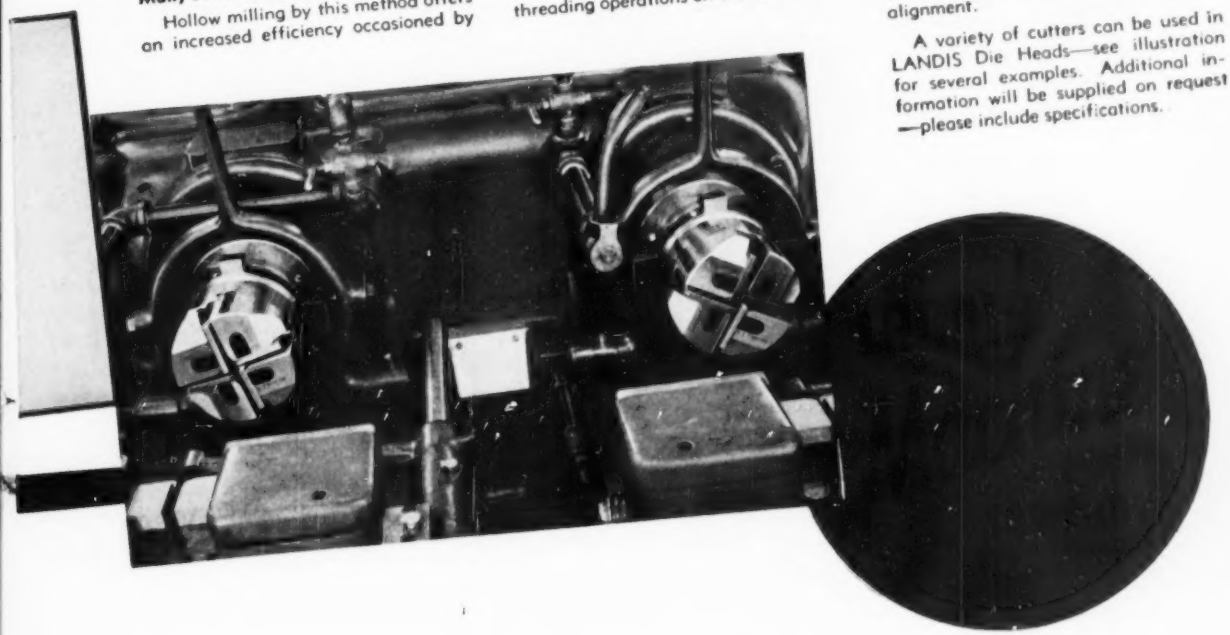
The LANDMACO Double Head Leadscrew Threading Machine affords a particularly efficient hollow milling method. One carriage will perform the milling operation while the other carriage is being loaded by the operator, thus allowing consistent continuous production. In addition it is entirely practical to perform milling operations on one spindle and conventional threading operations on the other.

LANDIS Turning Cutters

LANDIS Cutters are economical tools for they are usable for most of their original length. Only the rake angle needs regrinding—a quick and simple procedure. One set of cutters will machine a wide diametrical range of work, and cutting speeds will range from 30 to 70 linear feet per minute

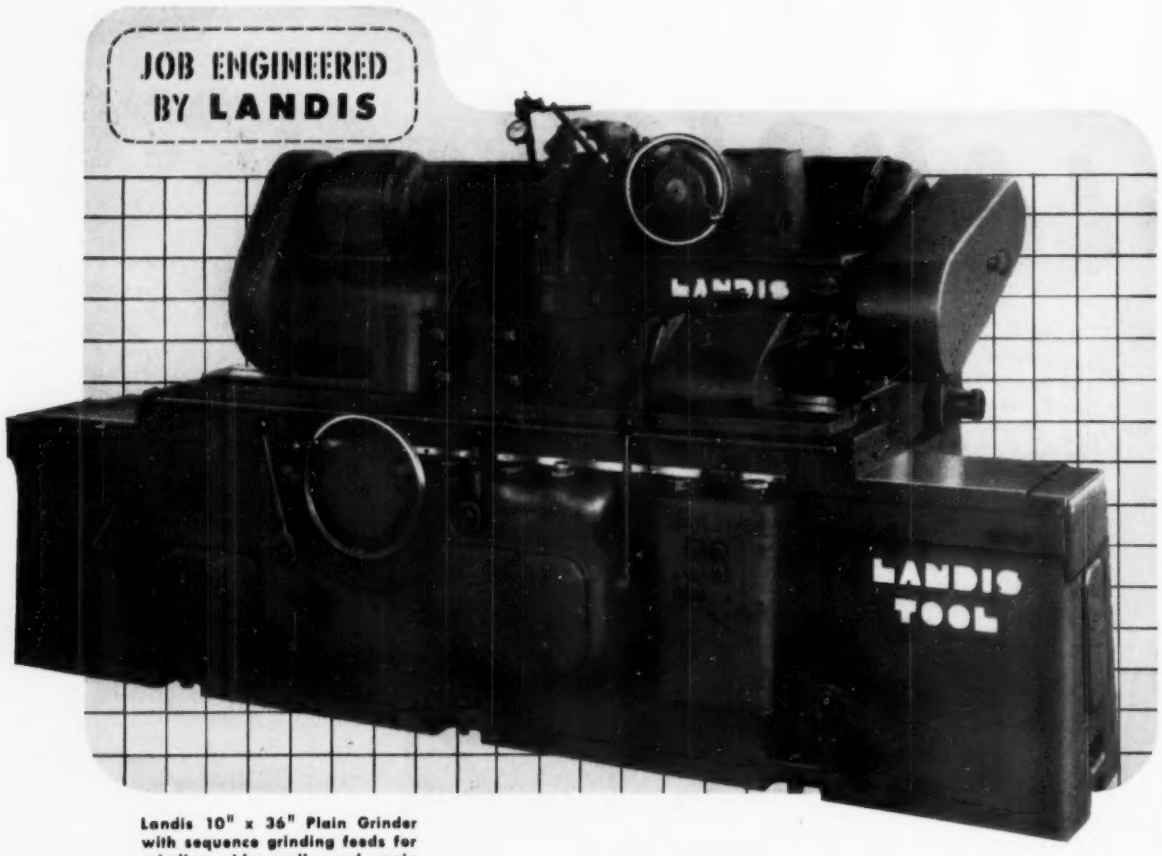
Wear and breakage of tools and spoiled work is held to a minimum. The cutting edges of the cutters can be precisely and uniformly located with relation to the center line of the work since they are diametrically-opposed in the cutting position. Thus with cutting strains evenly distributed, the workpiece is never forced out of alignment.

A variety of cutters can be used in LANDIS Die Heads—see illustration for several examples. Additional information will be supplied on request —please include specifications.



How LANDIS JOB ENGINEERING Cuts Grinding Costs . . .

Added Tooling on Plain Grinders Gives BIG Cost Savings



Landis 10" x 36" Plain Grinder with sequence grinding feeds for grinding side walls and main bearings of crankshafts.

Job engineering by Landis starts with operator convenience, hydraulic controls and simplified maintenance of a standard Landis grinder. Then, on the basis of your requirements of finish, tolerance and production, additional tooling may be recommended to give you best results at the lowest possible cost. Automatic grinding cycles, angular wheelbase or spaced wheels are only a few of the many tooling arrangements that will give you big cost savings.

Send us your prints for tooling and production estimates. No obligation.

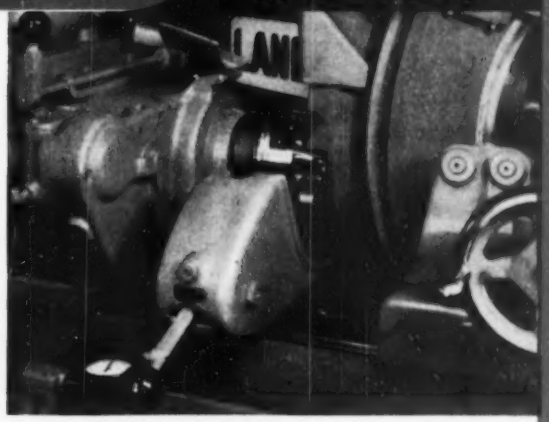
140

LANDIS

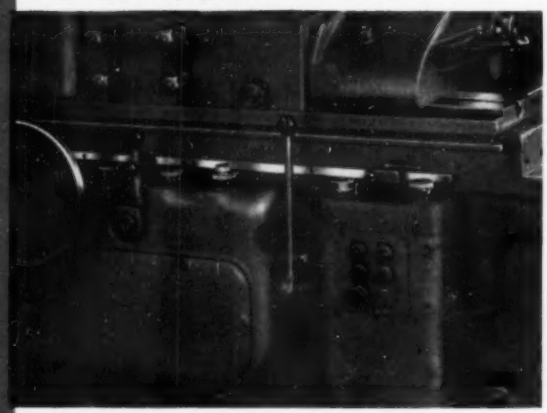
precision grinders

JOB ENGINEERED BY LANDIS

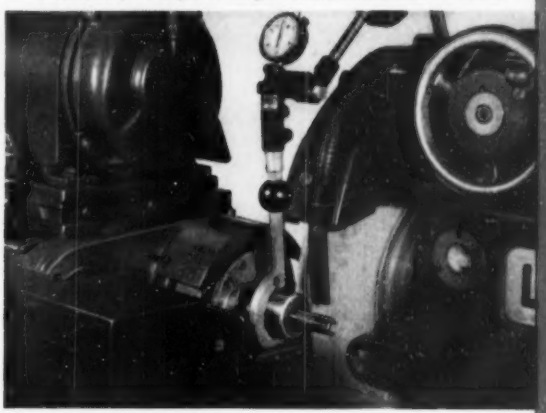
SHOULDER GRINDING for short runs of pieces which require accurate grinding of shoulders in combination with the O.D. grinding operation.



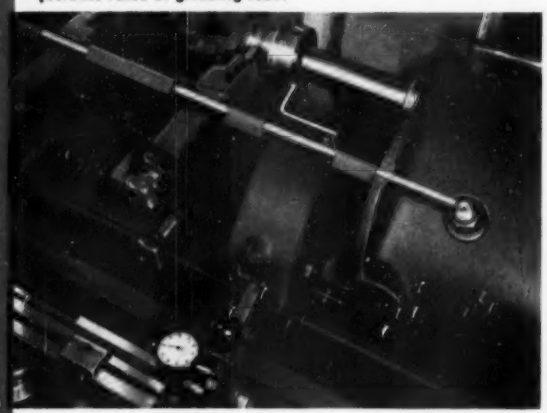
LIVE SPINDLE HEADSTOCK permits efficient O.D. grinding of diameters and faces of parts which are best suited to chucking. Straight or angle wheel heads can be used.



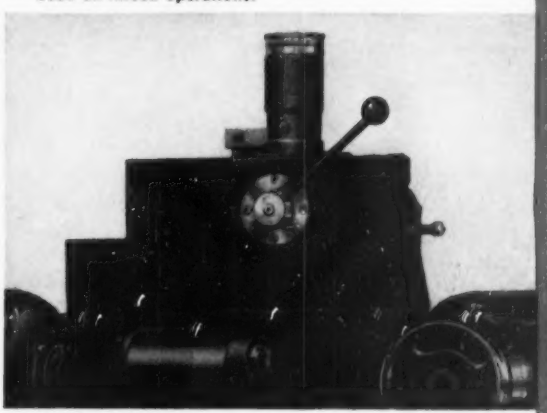
SEQUENCE RATE FEEDS for pieces which have combined sidewall and O.D. grinding. Gives separately adjustable rates of grinding feed.



AUTOMATIC SIZING reduces need for operator skill by stopping grinding feed when finished size is reached. Used on infeed operations.

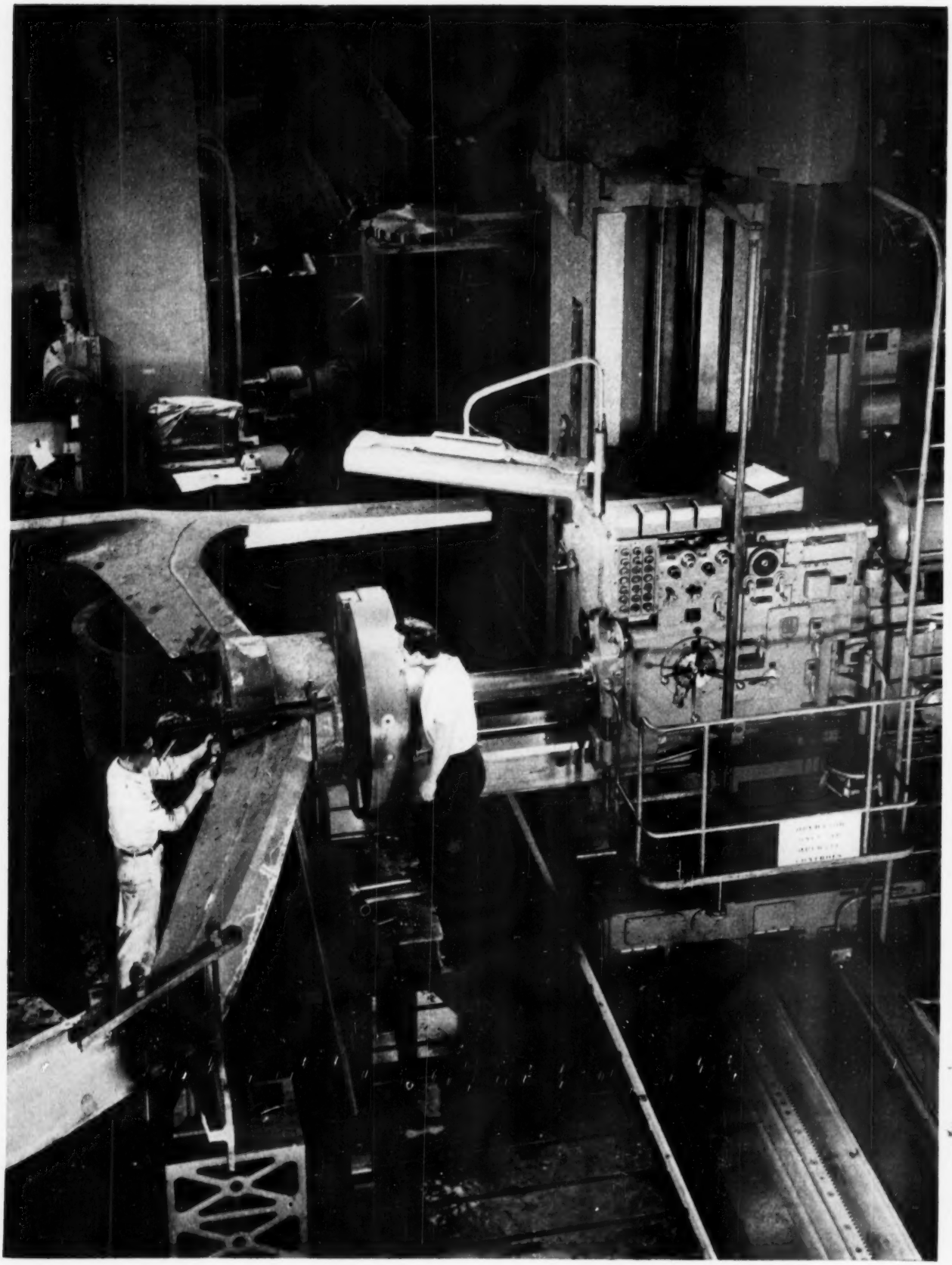


LATERAL LOCATING aligns work piece and wheel quickly and accurately. Eliminates possibility of work and wheel interference during rapid approach of wheel head.



PROFILE DRESSERS in a wide variety of types. Designed for precision dressing of shapes and radii on grinding wheels. Can save you time and eliminate extra operations.

LANDIS TOOL COMPANY • WAYNESBORO, PENNSYLVANIA, U. S. A.



Machinist's mate... large economy size!

Here's a machine tool that's got everything—versatility, capacity, speed, power and precision. On it, a master machinist can do practically anything. It's a heavy-duty, G&L 50 Series Horizontal Boring, Drilling and Milling Machine

Here's a superb machine that skilled machinists dream of working with. You can bore, drill or mill with equally high efficiency no matter what the workpiece . . . large or small, simple or complex.

Smooth, versatile and powerful . . . it's a machine that performs multiple operations from a single setup. Extremely rigid, with over 100 speeds and an unusually wide range of feeds, a 50 Series machine simplifies every job. And it's built to maintain its new machine accuracy for many years to come.

Quality-built to the most exacting standards, G&L 50 Series machines are available in table, floor and planer types . . . with runways, columns and tables to meet any practical requirement. For complete details, see your G&L representative or write for Catalog and Bulletin N-1.

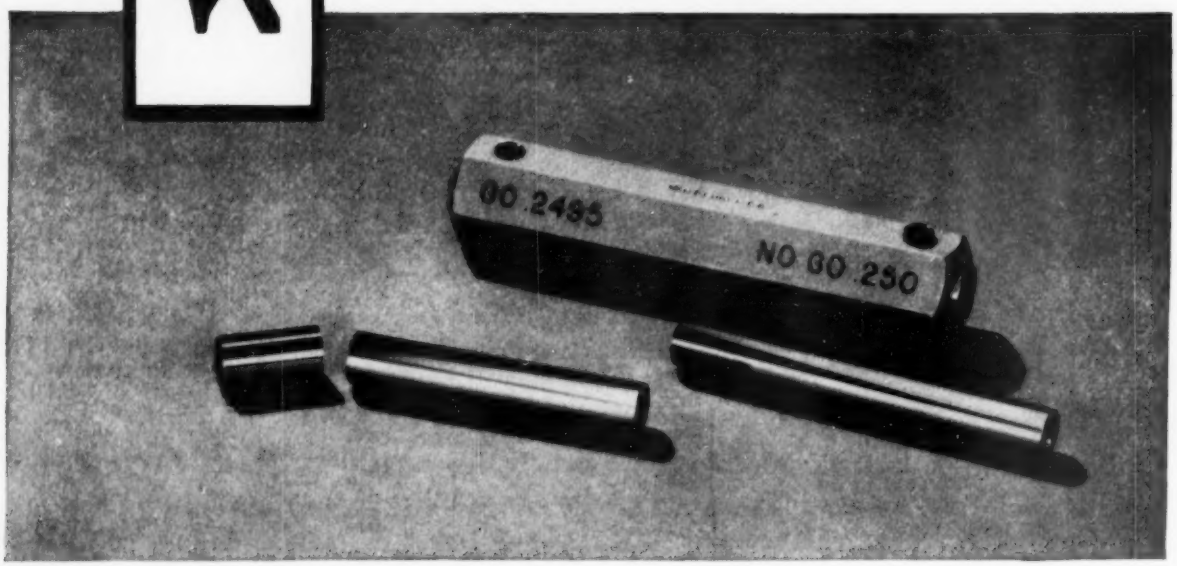
GIDDINGS & LEWIS MACHINE TOOL CO.

FOND DU LAC, WISCONSIN

Builders of the world's finest heavy-duty machine tools — Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; Hypro Double Housing and Openside Planers; Planer Type Milling Machines, Vertical Boring Mills; and Davis Cutting Tools

Photo courtesy of National Supply Co., Torrance, Calif., shows 50 Series Floor type machine boring and facing the stern propeller shaft housing in the skeg casting for an ocean-going freighter.

VK WIRE TYPE PLUG GAGES



VASTLY LONGER-LIVED *and* MONEY-SAVERS . . .

because they're "Cut-Off-Able" as well as "Reversible"

As a Van Keuren agent put it, "They're not only reversible, they're cut-off-able." And that means when you buy Van Keuren Wire Type Plug Gages, the sizes below 3/8" may be cut off when ends become worn and as many as from five to ten gages made available from the 1 7/8" and 2" long units. It is not only economical and practical to use Van Keuren Gages but it is a very simple operation to cut off the ends by following instructions furnished on request. The illustration above shows clearly the cut-off and reversible features.

VK Wire Type Gages are available in ZZ to XX accuracies in sizes from .001" to 1.000". They are furnished in alloy tool steel, high speed steel, chromium plate or tungsten carbide. Whatever the gaging job, the extra length provided in VK units will save you money. It will also pay you to take advantage of VK deliveries. In many cases we can ship your requirements from stock.

VK Wire Type Plug Gages are fully described in Catalog & Hand Book No. 35, available on request by writing to: The Van Keuren Co., 173 Waltham St., Watertown, Mass.

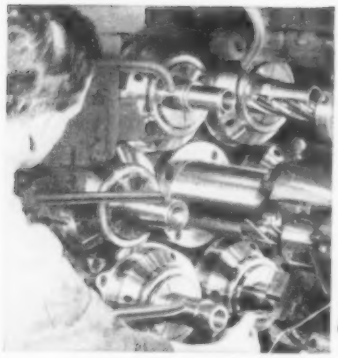
VK

34th YEAR

THE Van Keuren CO.,

173 WALTHAM STREET, WATERTOWN, MASS.

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Cemented Carbide Plug Gages • Carboloy Cemented Carbide Measuring Wires • Chrome Carbide Taper Insert Plug Gages



"He who makes no mistakes does nothing"

In a supposedly modern era it is sometimes claimed to be "smart business" to let a competitor take the lead and make profit from his mistakes. Obviously, if all business adhered to such a philosophy there would be no progress, if any business. "He who makes no mistakes does nothing". Cone leadership was founded — and is maintained — by active service, by doing things.

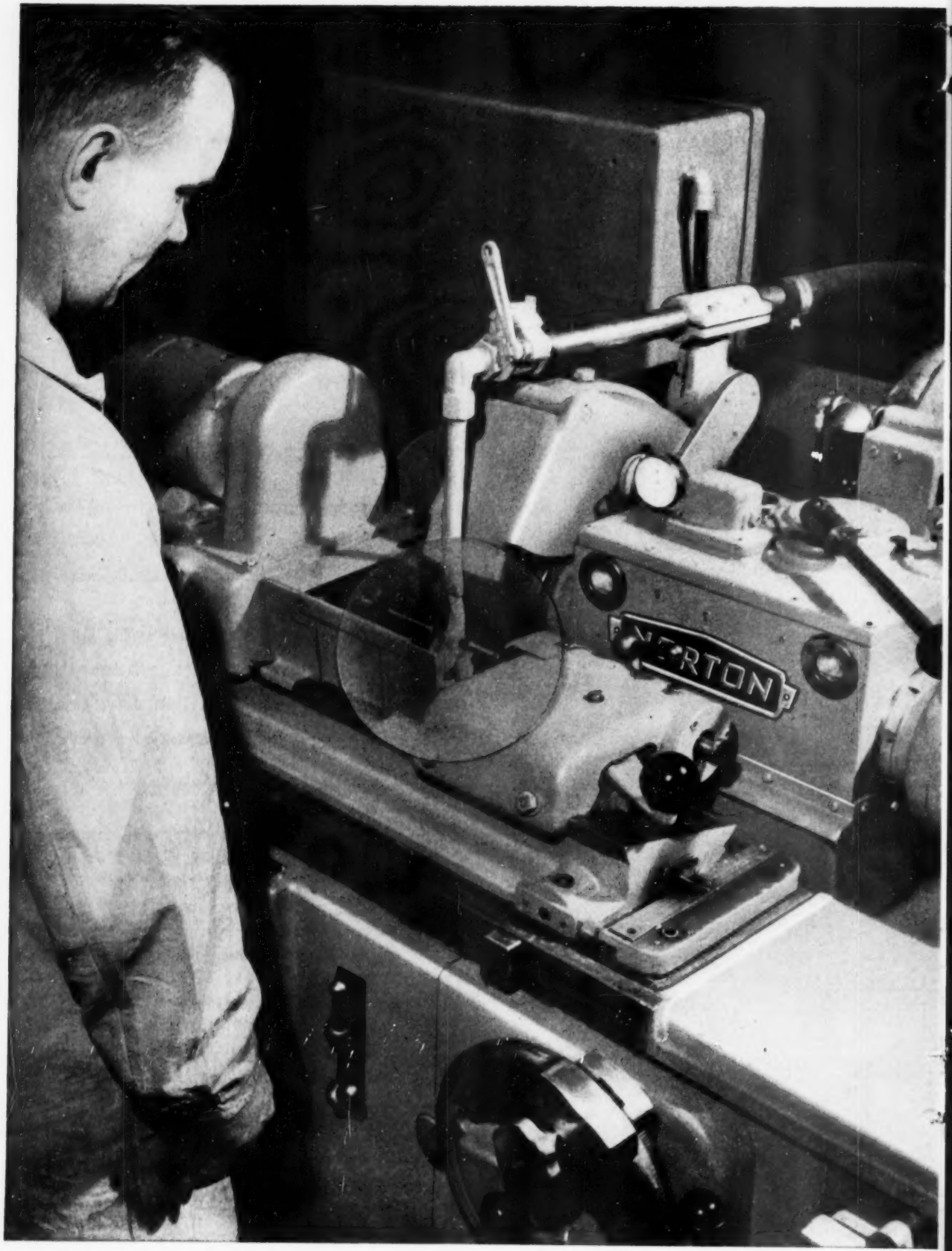
The Conomatic Carbide Development program expects to make a few mistakes. But, loss or gain, its efforts will contribute to the general benefit of all "automatic" users, users on whom all "automatic" builders are dependent.

The job illustrated compares actual production runs with HSS and 100% carbide tooling. It suggests the kind of pioneering that is being done at Cone. Full details are available.

MATERIAL—1112 STEEL: Hole drilled with 1" dia. drill to 2¾" depth. OD threaded to 2" length with 1¼"—12 chasers.

	HSS	CARBIDE
Cycle Time	90 secs.	15 Secs.
Work Spindle Speed	370 R.P.M. at 103 S.F.	1500 R. P. M. at 417 S. F.
Tool Wear	1500 pcs. per grind	5000 pcs. per grind

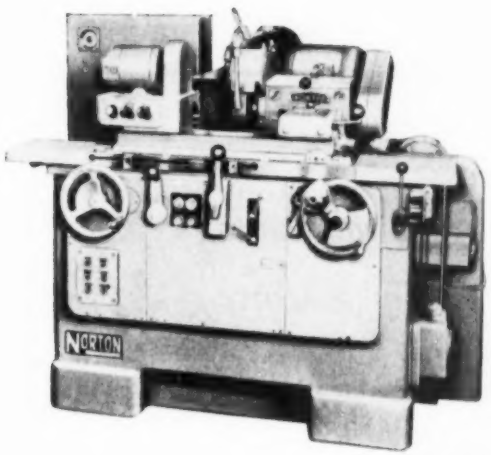
Conomatic } CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.


NORTON

SMALL PARTS PAY OFF BIG . . . WITH THIS

"TOUCH OF GOLD"

The new Norton 4" type CTU Cylindrical Grinder gives you high precision plus high production



Here's a cylindrical grinder you can get as either a Plain Machine for traverse work, or as a Semiautomatic for plunge operations — in 12" or 18" work length capacities in both models.

Either way you'll get the added "Touch of Gold" by faster, more accurate, more profitable grinding of a wide variety of small parts. Because either way the 4" Type CTU's Norton-developed features bring a new ease of operation for your men — and a new high in production quality and quantity for *you*.

To name just one of these advanced features, there's the extremely rugged wheel spindle unit that assures enduring precision in jobs ranging from heavy stock removal to fine finishing. But why not get the whole story of this speedy, profit-boosting grinder from your Norton Representative?

Write for Catalog No. 531. And remember: only Norton offers you such long experience in both grinding wheels and machines — your assurance of the value-adding "Touch of Gold" that means better products at lower cost. NORTON COMPANY, Worcester 6, Mass.

To Economize Modernize With **NEW**

NORTON

GRINDERS and LAPPERS

Making better products to make other products better

District Sales Offices: Hartford • New York • Cleveland • Chicago • Detroit • *In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5, Ontario

A NEW PAGE IN THE HISTORY OF INDUSTRIAL MACHINERY SUPPLY

Now...set up in your plant...ready to produce...

"PACKAGED"*

Piecemeal purchasing is eliminated. Single-source buying enables you to get an integrated installation...in the shortest possible time...for the most attractive investment.

This newly announced service of the Lake Erie Engineering Corporation is not an experiment. It is something we are doing more and more for leading plants throughout industry. It is a natural outgrowth of the ever increasing desire of our customers for our specialized services. As a result, we have the resources...the staff...the experience...to offer you the complete service described at the right. Call us. Then you will fully appreciate the advantages of a central responsible source. You will not be obligated...but you will be pleased.

INDUSTRIES SERVED BY LAKE ERIE ARE TYPIFIED BY THESE CUSTOMERS:

Allegheny-Ludlum Steel Co.
American Car & Foundry Co.
Bethlehem Steel Company
Boeing Airplane Company
The Dow Chemical Company
Eastman Kodak Company
The Electric Auto-Lite Co.
Ford Motor Company
Gates Rubber Company
Goodyear Tire & Rubber Co.
General Electric Company
International Harvester Co.
Molded Products Corp.
Mullins Mfg. Corp.
Norris-Thermador Corp.
Norton Company
Oak Ridge Atomic Laboratory
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Rheem Mfg. Company
A. O. Smith Corp.
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Thompson Products, Inc.
Westinghouse Electric Corp.
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LAKE ERIE PRODUCTION EQUIPMENT

HYDRAULIC PRESSES

For all forming operations...forging including shells...extrusion of all non-ferrous metals...extrusion of steel, both hot and cold...molding of abrasives, refractories, metal powder, plastics, rubber and wood...and other production processes requiring the application of pressure.

DIE CASTING MACHINES

Die casting machines for aluminum, brass, zinc and magnesium...including trimming presses, die separating presses, furnaces and tools.

INSTALLATIONS"

of Lake Erie production equipment including tooling

✳ THIS IS THE "PACKAGE"

The complete service or any part of it is available as required.

1. We discuss and explore your requirements with your management and engineers.
2. We submit a detailed proposal for your review and consideration.
3. We prepare an installation layout if one is needed.
4. We design, manufacture, and supply the basic machinery, tools and dies, conveyors, loading mechanisms, furnaces, or any other related auxiliaries.
5. Our field force installs or supervises the installation of the complete equipment in your plant.
6. We place the equipment in operation and train your supervisory and production personnel.
7. We assume responsibility for the satisfactory performance of the equipment as an integrated plant.

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ENGINEERING CORP.
BUFFALO, N.Y. U.S.A.

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LAKE ERIE ENGINEERING CORPORATION

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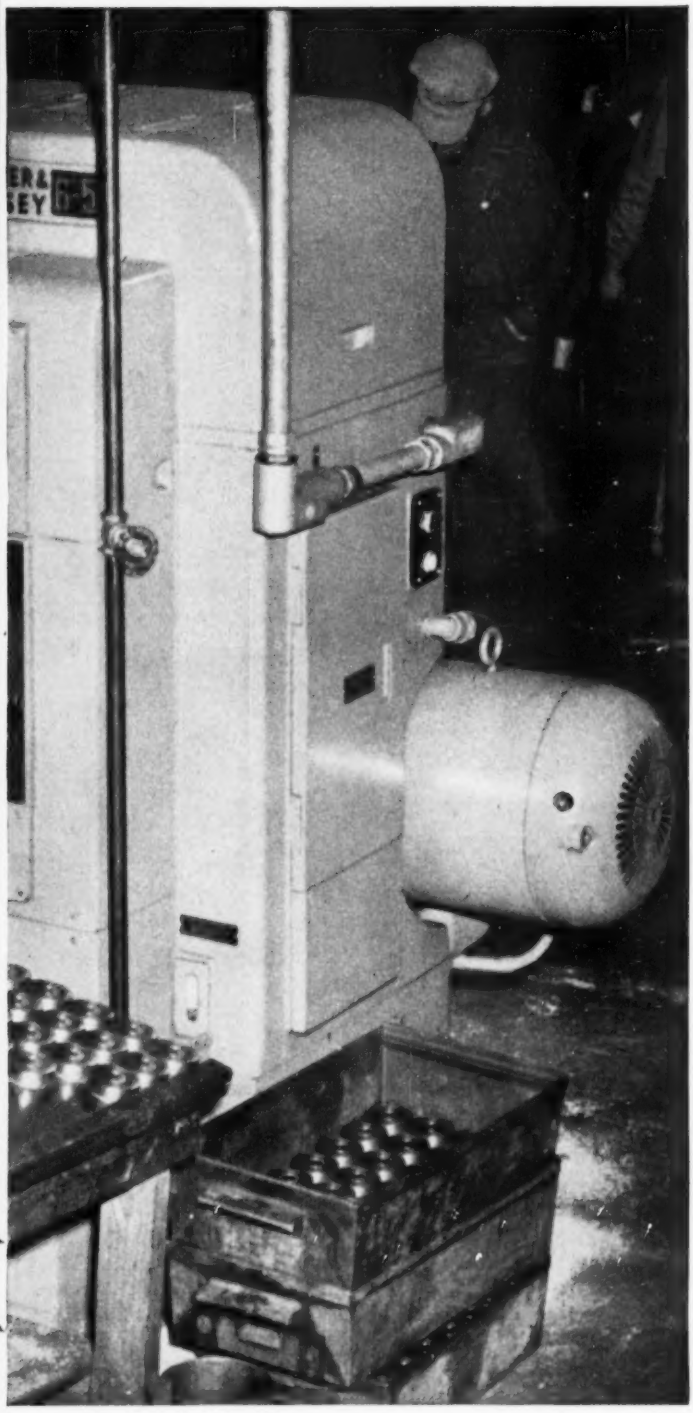
HYDRAULIC PRESSES • DIE CASTING MACHINES
ROLLING MILL AUXILIARY EQUIPMENT

LAKE ERIE®

AUTOMATIC PAYS FOR ITSELF

YOU CAN PRODUCE IT BETTER, FASTER FOR LESS WITH WARNER & SWASEY

IN ONE YEAR'S OPERATION!



THIS STORY comes from the production-minded Eureka-Williams Corporation of Bloomington, Illinois. Shooting for greater production, they installed a Warner & Swasey 5-Spindle Automatic Chucking Machine to machine the cast iron valve discs used in their oil burners.

The first month's production records showed the machine had more than lived up to expectations. During the month, the machine turned out as many parts as seven hand-operated machines! And it reduced the machining cost on the parts 45%. Records for subsequent months showed even increased savings—and that the machine actually paid for itself in the first year's operation!

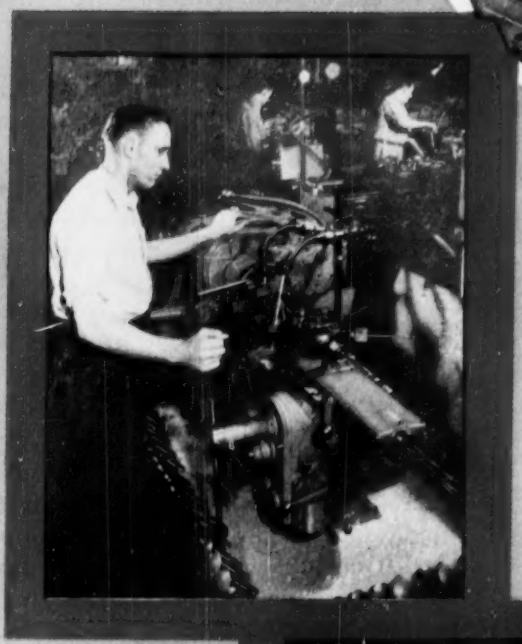
Eureka-Williams has found that the 5-Spindle Automatic is quick and easy to set up, that operators like the machine, that it has provided them the dependable, high precision operation you can expect from any Warner & Swasey.

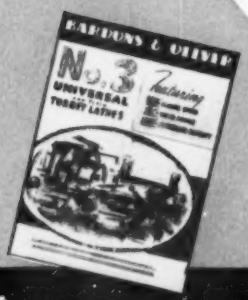
Certain jobs in your shop—even small and medium lot runs—can undoubtedly be machined faster, more uniformly, and at lower cost on Warner & Swasey Automatics. Your nearest Warner & Swasey Field Representative will be glad to show you exactly how an automatic can improve *your* operations.

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

MACHINE TOOLS, TEXTILE MACHINERY, CONSTRUCTION MACHINERY

RECENT INSTALLATION OF TURRET LATHES AT





Photographs Courtesy of Thompson Products, Inc.

Send for New No. 3 Catalog . . .

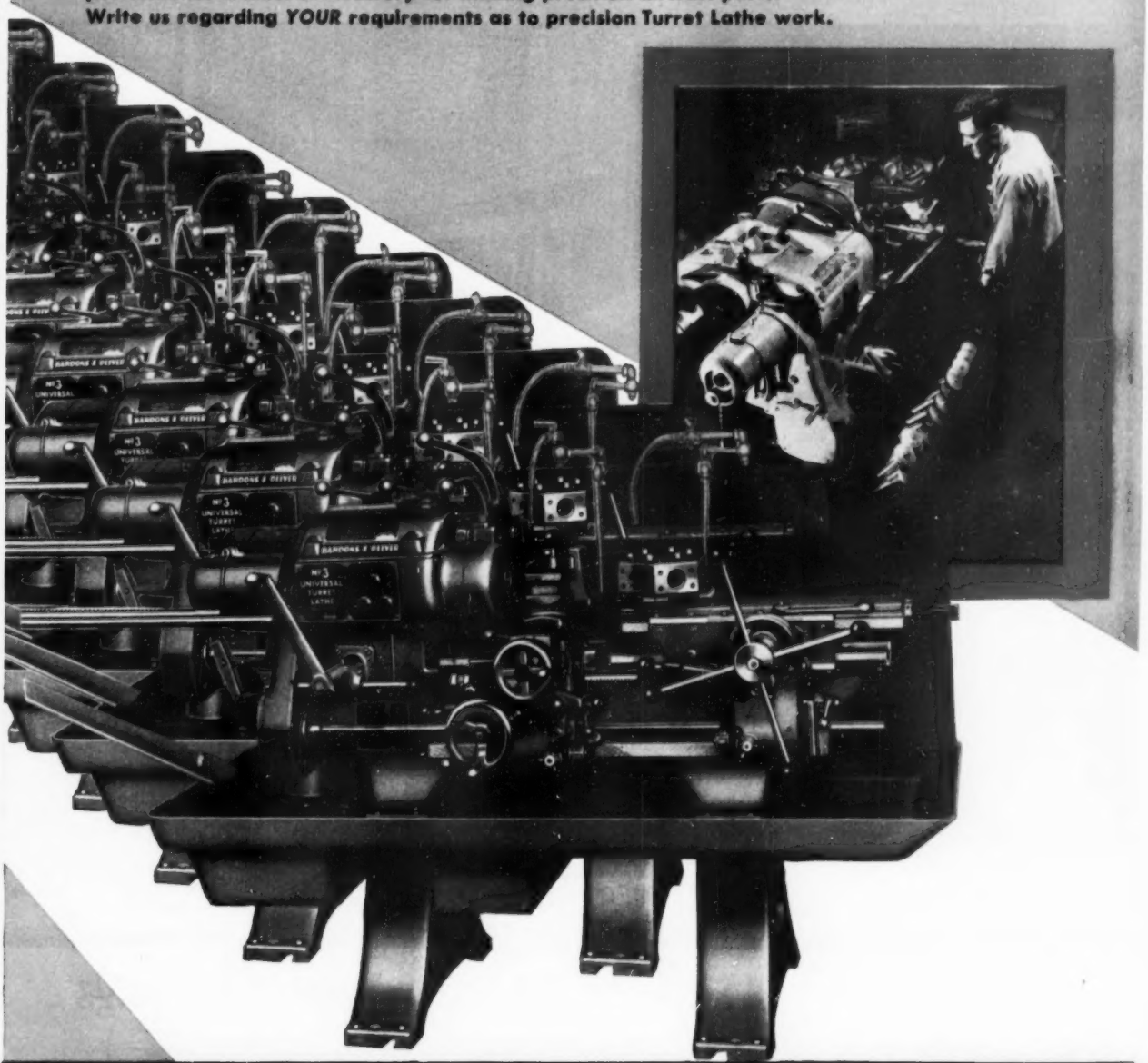
MANUFACTURERS OF A COMPLETE LINE OF
TURRET LATHES AND CUTTING OFF LATHES

22 BARDONS & OLIVER NO. 3
Thompson Products, Inc.

This installation started with only four Turret Lathes and has grown to the present twenty-two.

The machine operators at Thompson Products, Inc. report that each lathe's performance is most satisfactory for making precision aircraft parts.

Write us regarding *YOUR* requirements as to precision Turret Lathe work.

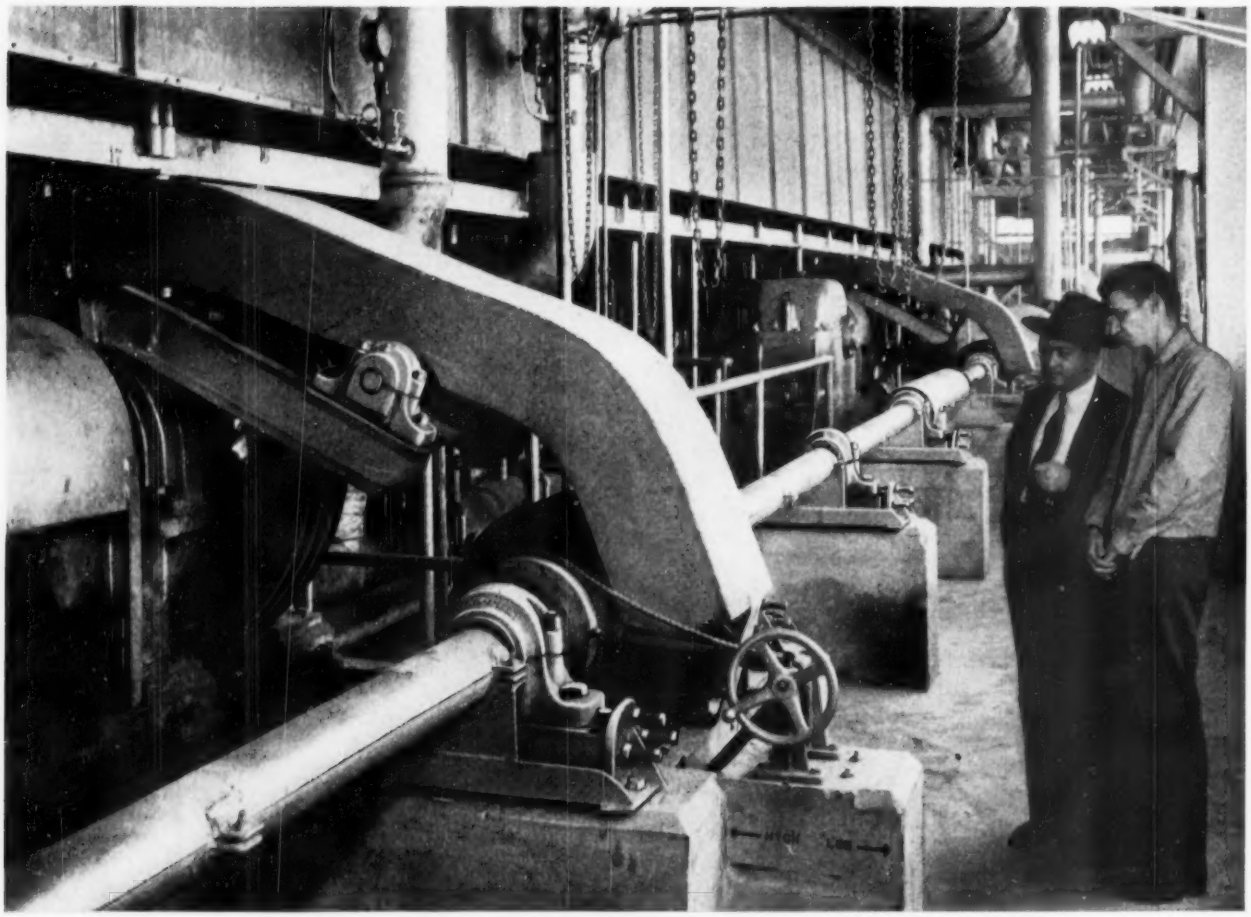


BARDONS & OLIVER, INC.

1134 WEST 9TH STREET • CLEVELAND 13, OHIO

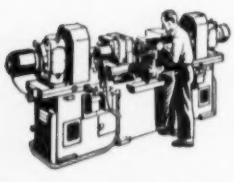
LINK-BELT ball and

...keep company with



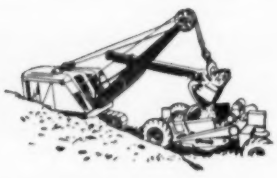
Link-Belt Roller Bearing Pillow Blocks assure smooth power transmission under varying atmospheric operating conditions. That's one reason why Downingtown Manufacturing Company used them on the main line shafts and variable speed drives of their felt making cylinder machine shown in service at The Ruberoid Company, Mobile, Ala.

LINK-BELT ball and roller bearings

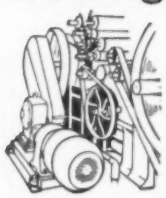


Metal Working Machinery

Farm Machinery



Construction Equipment



Textile Machines

roller bearings

America's hardest-working machines

The efficiency and life of any machine are dependent on the quality and accuracy of its bearings. That's why so many equipment designers specify Link-Belt on their heaviest-duty machines.

Link-Belt precision Ball and Roller Bearings have proved—on thousands of applications—that they are the long-life answer for tough service. Integrally self-aligned, they have full load capacity for both thrust and radial loads.

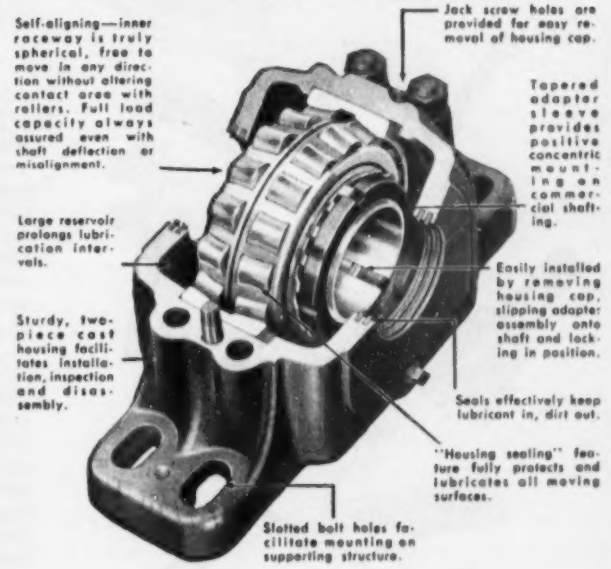
There are Link-Belt ball or roller bearings to meet every industrial need, and a Link-Belt bearing specialist near you will help apply them to your particular requirements. You can also get all the facts from Data Book 2550.

LINK-BELT

BALL and ROLLER BEARINGS

13.274

CUTAWAY OF SERIES 6800-6900 TWO-PIECE ROLLER BEARING PILLOW BLOCK


Self-aligning—inner raceway is truly spherical, free to move in any direction without altering contact area with rollers. Full load capacity always assured even with shaft deflection or misalignment.
Jack screw holes are provided for easy removal of housing cap.
Tapered adapter sleeve provides positive concentric mounting on commercial shafting.
Large reservoir prolongs lubrication intervals.
Easily installed by removing housing cap, slipping adapter assembly onto shaft and locking in position.
Sturdy, two-piece cast housing facilitates installation, inspection and disassembly.
Seals effectively keep lubricant in, dirt out.
"Housing sealing" feature fully protects and lubricates all moving surfaces.
Slotted bolt holes facilitate mounting on supporting structure.

One of many types in the Link-Belt line of Pillow Blocks, Flanged, Flanged Cartridge, Cartridge, Hanger, Take-Up Blocks and Unmounted Bearings.

LINK-BELT COMPANY: Plants: Indianapolis, Chicago, Philadelphia, Colmar, Pa., Atlanta, Houston, Minneapolis, San Francisco, Los Angeles, Seattle; Scarboro, Toronto and Elmira, Ont. (Canada); Springs (South Africa); Sydney (Australia). Sales Offices, Factory Branch Stores and Distributors in Principal Cities.

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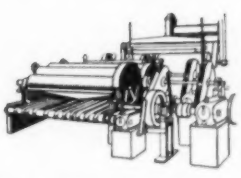
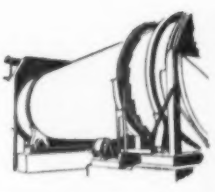
smooth the path of power for all industry



Pulp & Paper Machinery

Materials Handling Equipment

Oil Field Equipment



Processing Equipment

ARMSTRONG

Use the Correct...

ARMSTRONG TOOL HOLDERS

to increase pieces, production and profits!

Because they do their work so well, without repairs, maintenance or replacement . . . because they last for years and have become as much a part of everyday operations as steel itself, the importance of using the correct type and size ARMSTRONG TOOL HOLDER for each operation, is frequently overlooked. It should always be remembered that by controlling the cutting point, ARMSTRONG TOOLS control both the productivity and efficiency of every lathe, planer, slotter, and shaper in most shops.

Tools so vitally situated, no matter how trouble-free, deserve periodic checking . . . checking to see that the correct size and correct type ARMSTRONG TOOL HOLDER is being used for each operation: checking to be sure that you are taking full advantage of the newer additions to the Armstrong System—the special types for ARMIDE (Carbide Tipped) Cutters, others for ARMOLOY (Cast Alloy) Bits and Blades; the newer "spring" form threading tools and cutting-off, etc., etc.

Write for a recent ARMSTRONG Catalog and check your tooling of each operation.

ARMSTRONG BROS. TOOL CO.

"THE TOOL HOLDER PEOPLE"

5215 W. ARMSTRONG AVENUE **CHICAGO 30, ILL.**

One hour

1800 lbs.-rough

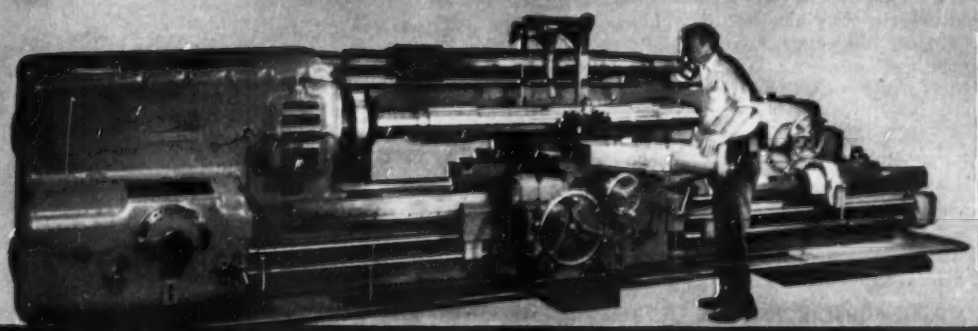
1300 lbs.-finished

One hour to finish turn this Diesel Locomotive Driving Axle from the rough forging, removing 500 pounds of chips and using 60 horse power cuts in the process.

This shows what a 25" "AMERICAN" Hydraulic Duplicating Lathe driven by a 50 H.P. motor can do. Production records of this kind are the rule rather than the exception and are being made daily.

"AMERICAN" Hydraulic Duplicating Lathes reduce machining time 50 to 75 per cent . . . cut costs to the bone . . . pay good dividends on the investment.

Repeat customers vouch for this in the most convincing way.



Bulletin No. 35 gives a complete description and shows many examples. It's yours for the asking.

THE AMERICAN TOOL WORKS CO. **Cincinnati, Ohio U.S.A.**

Lathes and Radial Drills

How Norton brings you the "TOUCH OF GOLD" that adds more value to every grinding job

Grinding, the most universal, most basic of all production processes, is the true "Touch of Gold" that increases the usefulness — and the value — of every manufactured article. That's what happens every time Norton grinding wheels touch the grinding jobs *you* do.

Here are the facts on how Norton leads the field in producing and improving the "Touch of Gold" for you and for all industry.

FIRST IN SIZE

At "Norton City" you'll find over a mile of buildings and thousands of skilled workers, constituting the greatest single supply source of abrasives and abrasive products — world headquarters for your "Touch of Gold". Here also is the world's newest, most modern grinding machine plant, and the famous Norton School of Grinding.

FIRST IN RESEARCH

At Norton over 100 trained technicians, in 19 specialized laboratories, are constantly engaged in product improvement and application. This includes not only the development of new abrasives, bonds and processing techniques, but cooperation with customers in the solution of everyday grinding problems. For the "Touch of Gold" that will solve your own grinding difficulties, look to the organization that leads all others in abrasive development. Look to Norton!

Make sure your grinding gets the top value-adding "TOUCH OF GOLD" — with Norton abrasive products

From Norton laboratories come "TOUCH OF GOLD" exclusives like these

Norton New-Process Wheels are unequalled for uniform structure, identical performance and long, even wear.

32 ALUNDUM* Abrasive, another Norton "first", is one of the most revolutionary developments in abrasive history.

NORBIDE* Abrasive, hardest man-made material, replaces costly diamond dust in many polishing and lapping jobs.

FIRST IN PRODUCT-RANGE

Norton offers you the most complete line of abrasive products, all manufactured to strictest quality control standards. Norton ALUNDUM* abrasives and CRYSTOLON* abrasives, together with Norton-developed bonds, make available hundreds of thousands of grinding combinations.

FIRST IN SERVICE

1. Your Norton Abrasive Engineer is skilled in every detail of grinding wheel manufacture and application. He's ready to go into your plant, study your grinding problems and help you find the money-saving answers.

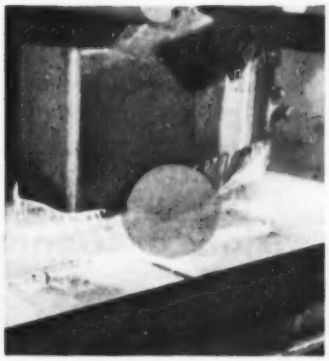
2. Norton Warehouses are located in key industrial centers. Each contains huge stocks, highly trained personnel and special wheel alteration equipment. And they are backed by the huge stocks at Worcester — further assurance that you'll get Norton wheels whenever you need them, wherever you're located.

3. Your Norton Distributor, with plenty of practical experience, can give you valuable help in selecting the right Norton wheels. Your distributor is careful to maintain always adequate stocks, selected to meet the particular needs of your area. He is your direct connecting link with the entire Norton organization — world headquarters for the "Touch of Gold" that means more profitable grinding for *you.* NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

NORTON
ABRASIVES
Making better products to make other products better

*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

ROUGH GRINDING



SURFACE GRINDING

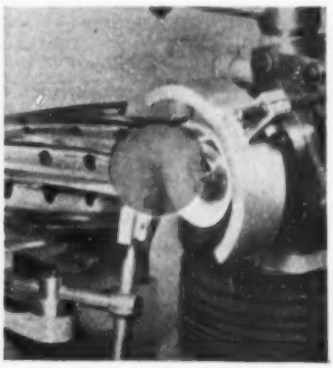
O. D. GRINDING

INTERNAL GRINDING

CUTTING-OFF

DIE AND MOLD GRINDING

BARREL TUMBLING



TOOL AND CUTTER GRINDING

PARKER-KALON®

originator and world's largest producer of hardened Self-tapping Screws, and a leading manufacturer of Socket Screws and other fasteners, is now a Division of General American Transportation Corporation

GENERAL AMERICAN, with principal offices in Chicago, owns and operates the nation's largest private fleet of freight cars which are leased to many of the foremost industrial companies, and to railroads. In addition, it is a major builder of all types of freight cars, owns and operates tank storage facilities, and is engaged in the manufacture of process equipment and molded plastics.

In pursuance of a program of diversification, General American has acquired the business and assets of the Parker-Kalon Corporation through the purchase of capital stock. The business will henceforth be operated as the Parker-Kalon Division of General American Transportation Corporation.

The present management of Parker-Kalon will continue in charge. The sales and service policies which have won the approval of the many thousands of P-K customers will remain in effect. As always, P-K Fasteners will be sold through P-K Distributors in every industrial area in the United States, Canada and in many foreign countries.

With the far greater resources available through its new ownership, Parker-Kalon will accelerate a program of improvement and expansion. New production and warehouse facilities will be built to meet the constantly increasing demands for P-K fasteners. Engineering and research will be augmented to speed the perfection of new P-K products now in development.

Now, even more than before, you can rely on Parker-Kalon for leadership in fastener design, for consistently high fastener quality, and service in step with your needs.

P-K TRADE MARK REG. U.S. PAT. OFF.

PARKER-KALON®

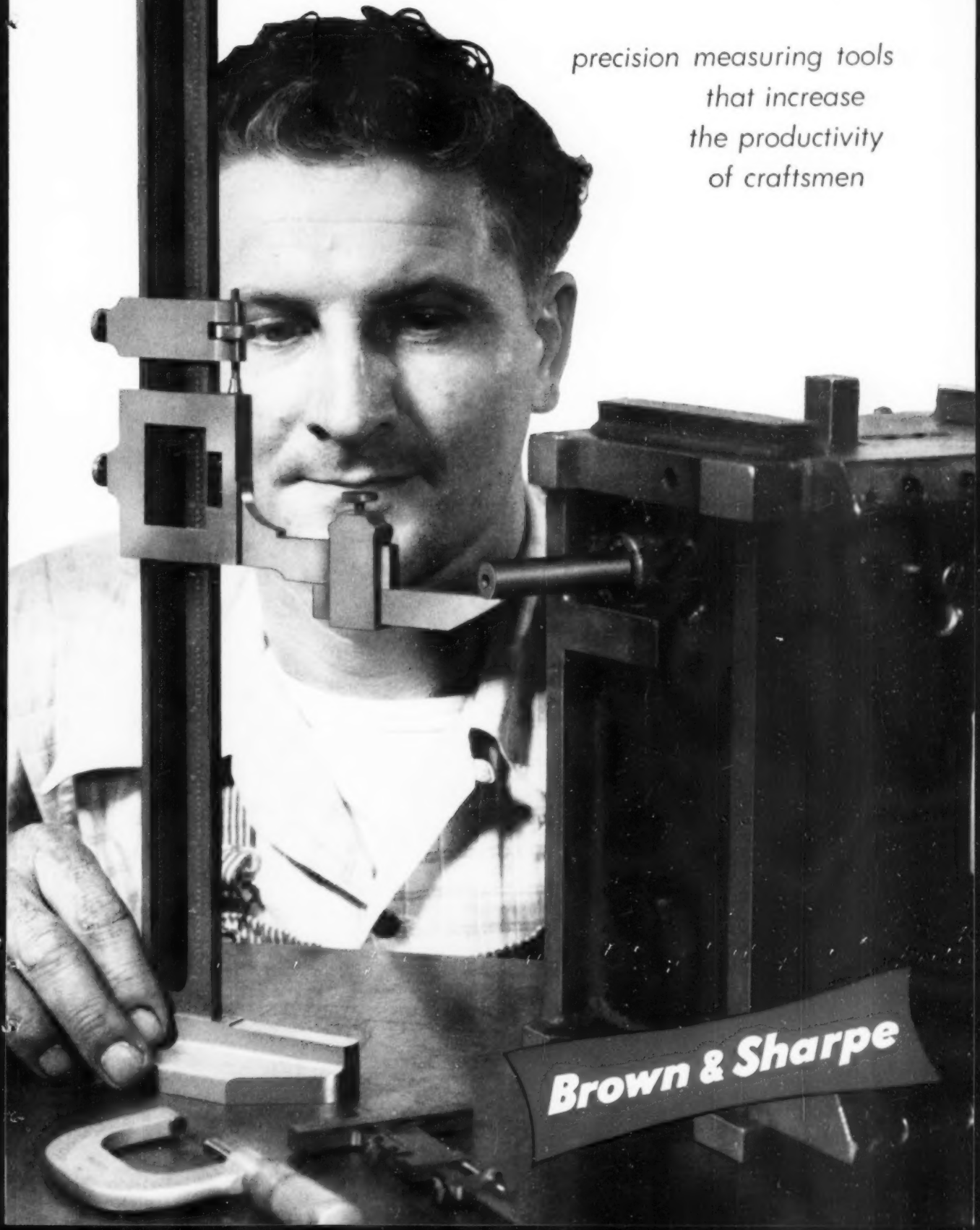
Division

General American Transportation Corporation
200 Varick Street, New York 14, N. Y.

GENERAL AMERICAN

SKILL BUILDERS...

precision measuring tools
that increase
the productivity
of craftsmen

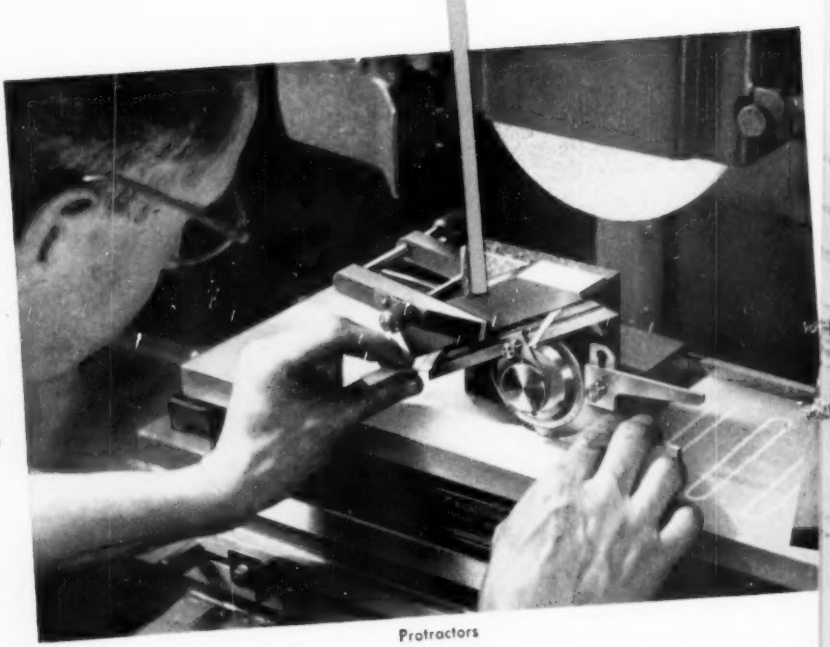


Brown & Sharpe

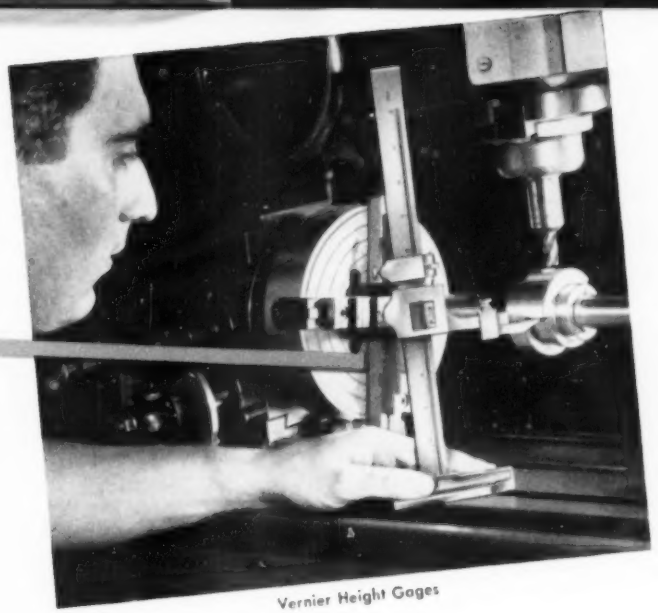
These Tools Create Confidence... make craftsmen more skillful

Micrometers

"Intrimik" Internal Tri-point Micrometers



Protractors



Vernier Height Gages

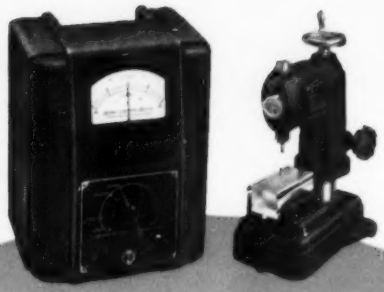
Throughout the metalworking industry, Brown & Sharpe Precision Measuring Tools command a respect and confidence which are reflected in greater accuracy and increased output of your precision products. That's why it pays you to invest in these quality tools. Craftsmen know that all Brown & Sharpe Products are conscientiously made "with the intention that they shall be the best in their respective classes".
The complete line of Brown & Sharpe Machinists' Tools is fully described in the new Catalog 35M. Write for your copy.

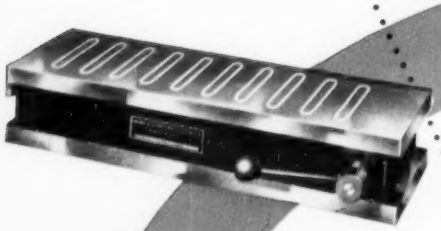
Brown & Sharpe

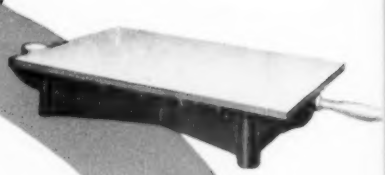
Vernier Calipers

Dial Test Indicators

Buy through your local Distributor







Electronic Measuring and Inspecting Equipment — continuously variable magnification with readings from .0001" to .00001". Amplifier separate from measuring units assures readings unaffected by amplifier heat. Stock and special external or internal measuring devices available for use with amplifier.

Permanent Magnet Chucks — work holding short-cut. Completely safe and portable. No electrical connections . . . hold work securely even when plant power fails. Wide choice of rectangular and rotary models.

Cast Iron Surface Plates — made from a uniformly hard iron, hand scraped to give you a true reference surface on which tools will slide smoothly and easily. Wide range of sizes.

Vital Shop Equipment for Increased Output of Precision Products

Cast Iron Straight Edges — long, narrow testing surfaces of great strength, rigidity, and accuracy. In lengths up to 15 feet.

Ground Flat Stock — Brown & Sharpe offers a choice of oil or water hardening types in 16 different thicknesses, from $\frac{1}{64}$" to 1".

Bench Centers—extremely simple and accurate means for holding cylindrical work while testing for concentricity, etc. Furnished with dial test indicator if desired.

Write for complete information on any of these Brown & Sharpe Products.

Buy through your local Distributor

Brown & Sharpe

Milling Machines • Grinding Machines • Screw Machines • Cutters • Machine Tool Accessories
Machinists' Tools • Electronic Measuring Equipment • Johansson Gage Blocks • Permanent Magnet Chucks • Pumps

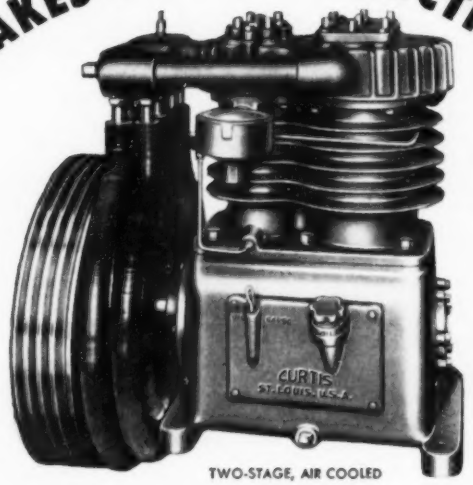
BROWN & SHARPE MFG. CO., PROVIDENCE 1, R. I., U. S. A.

Printed in U.S.A.

Dependable, Efficient

Curtis AIR COMPRESSORS AIR HOISTS AIR CYLINDERS

MAKES YOUR PRODUCTION MORE PROFITABLE

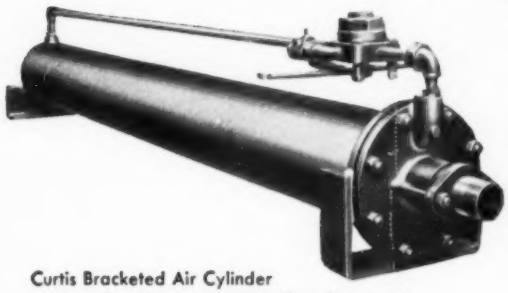


TWO-STAGE, AIR COOLED

PRECISION BUILT COMPRESSORS UP TO 50 H.P.

- Advanced two-stage design saves electric current.
- Delivers more air per horsepower.
- Timken tapered main bearings.
- Pressure lubricated rod and piston bearings.
- Assures long trouble-free performance.

TIME-SAVING Curtis Air Cylinders and Air Hoists



Curtis Bracketed Air Cylinder can be placed in any position from horizontal to vertical. Will lift, lower, push or pull.

- Low-Cost lifting, lowering, pushing, or pulling
- Accurately controlled operating speed
- Cylinders are ground and polished
- Valve is of disc type lapped to its seat.

Curtis Pendant Air Hoist for any lifting or lowering job where headroom is not limited.

FOR COMPLETE INFORMATION and technical data, mail this coupon today . . .

CURTIS PNEUMATIC MACHINERY DIVISION
of Curtis Manufacturing Company
1924 Kienlen Avenue, St. Louis 20, Mo.
99 Years of Successful Manufacturing Experience

CURTIS PNEUMATIC MACHINERY DIVISION 741
of Curtis Manufacturing Co.
1924 Kienlen Avenue, St. Louis 20, Mo.

I am interested in items checked below:

☐ AIR COMPRESSORS ☐ AIR HOISTS ☐ AIR CYLINDERS

Capacity . . . Current . . . Load . . . Lift . . . Load . . . . . Lift . . . . .

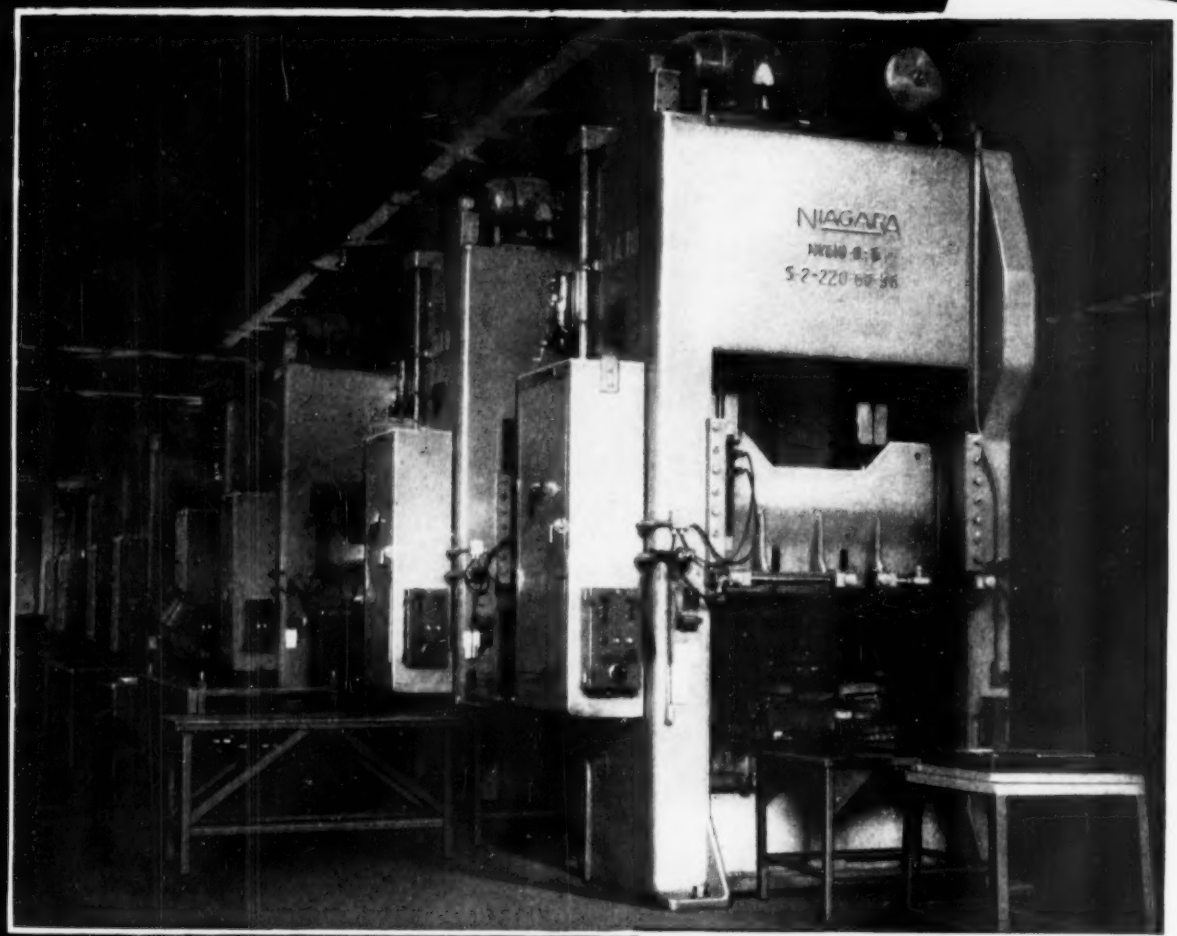
Name . . . . . .

Firm . . . . . .

Street . . . . . .

City . . . . . Zone . . . . State . . . . . .

NIAGARA



Typical production line of
Niagara Straight Side Double
Crank Presses in one of America's
foremost automotive plants

NIAGARA MACHINE & TOOL WORKS · BUFFALO 11, N. Y.

straight side double crank
PRESSES
Speeding up Production in Large Automotive Plants

Niagara advanced engineering features and modern streamline styling combine to make these presses leaders in their field.

- Electrically welded steel construction
- Air actuated electrically controlled sleeve and friction clutches
- Anti-friction bearing mounting for high speed shafts, flywheel and clutch wheels
- Gearing enclosed and running in oil
- Neither gearing nor shafting overhang the working area to block light and be a potential danger
- Single and double geared
- Single or double end (twin) drive
- Adjustable air counterbalance for slide
- Pneumatic draw cushions with adjustable pressure and surge tank
- Wide range of sizes and capacities
- J. I. C. features if desired

Write for catalog

Manufacturers of a complete line of sheet metal working equipment ranging from small hand tools up to large power operated machinery.

DISTRICT OFFICES: DETROIT • CLEVELAND • NEW YORK

ANNOUNCING the new BRYANT

BRYANT proudly introduces the newest member of the Bryant family of precision machines — the Bryant 998 Boring Machine — a production machine for precision boring, drilling, turning, facing, grooving and contour turning and boring where fine finish and rapid production are desired.

The Bryant 998 can be tooled either as a single purpose machine for quantity production or for miscellaneous work on small lots. Because it is all-mechanical, its cycle is positive and constant.

Smooth, uniform motion of the table and freedom from vibration, so essential to generating a fine finish with a single point tool, are assured by the 998. Its bed, bridge, heads and table are Meehanite castings. The table moves on preloaded ball bearing slide bars and is mechanically actuated by a simple cam and lever unit. Cam and change gears are easily accessible for changing either the length of stroke or the rate of travel. The motors for driving the cam and the boring heads are mounted in an accessible cavity inside the bed, thus keeping floor space to a minimum. This cavity is fan ventilated.

Ample fixture mounting surface is provided by the table, which measures 17½" x 22". The table has three ½" T-slots, and will accommodate a wide variety of fixtures. Machined setup pads are provided on the bridge for ease in locating fixtures.

The design of the Bryant 998 takes full advantage of standard purchased parts. Brakes, motors, air cylinder, bearings, pneumatic follower system, lubrication hoses and all electrical apparatus are stock items. Either low or high pressure coolant systems are available. All electrical equipment conforms to J. I. C. standards.

BORING MACHINE

Design

- The bed, bridge, table and heads are normalized Meehanite castings.
- The cam actuated table moves on preloaded ball slide bars.
- The cam is hardened and ground.
- The boring head spindles rotate in preloaded super-precision ball bearings. A graduated spindle nose and eccentric bushing for tool setting are standard.
- An air cylinder opposes the work table motion directly with constant pressure and keeps the cam follower roll and the cam always in contact.
- The boring head drive is completely accessible and is designed for long life.
- The cam drive assembly is protected by a torque limiting clutch.
- Cycle time is controlled by precision change gears in the cam drive gear box.
- An ample pad is provided at the rear of the machine for mounting accessory equipment.

Operation

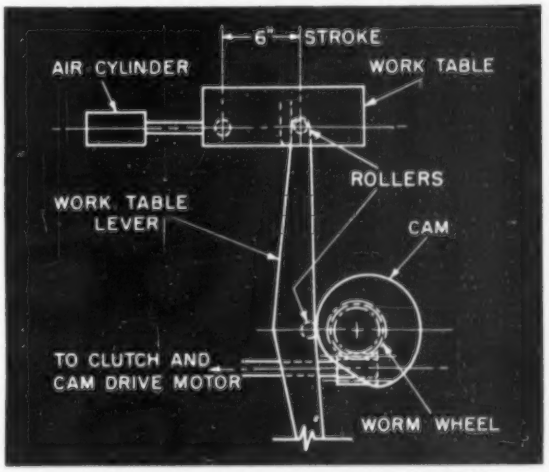
- Push button controls are conveniently located on a panel at the front of the machine.
- Cycle can be manual, semi-automatic or fully automatic.
- An emergency stop button will instantaneously interrupt the cycle.
- Jog buttons are located on both the front and the rear of the machine for setup purposes.
- Machined setup pads are provided on the bridge for ease in locating fixtures.

Maintenance

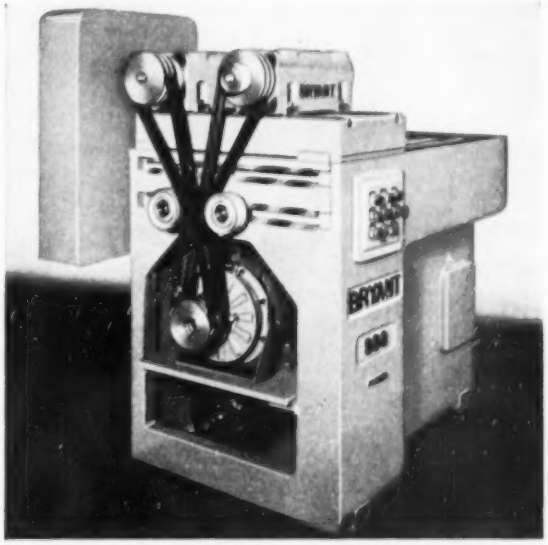
- Maintenance is necessary at only three points: two grease fittings on the cam follower assembly and cleaning and lubricating of the filter-lubricator unit in the pneumatic system.
- The ball slide table is grease sealed.
- Gear box has its own closed lubrication system.
- The boring head bearings are permanently grease sealed.
- The cam is easily accessible for changing the table stroke. It is taper mounted and keyed to the drive shaft to ensure ease of changing and accurate mounting.
- The change gears are enclosed in their own wet sump, splash lubrication system.
- Brakes, motors, air cylinder, bearings, pneumatic follower system, lubrication hoses and all electrical apparatus are standard purchased parts.

Write today for complete information and specifications!

Smooth response of the table is ensured by the special Bryant slide bar design. Each bearing is a hardened steel sleeve containing numerous ⅜" diameter preloaded balls. This provides a metal-to-metal contact which resists forces in all directions and transmits stresses directly to the bed.



The table is actuated by an inexpensive, quick-change cam working through a follower and lever arm. An air cylinder opposes the work table motion, keeping the cam follower and the cam always in contact to completely eliminate back-lash and jump.



Cam drive and boring head motors are mounted in a well ventilated cavity in the bed.

BRYANT Chucking Grinder Company
Springfield, Vermont, U. S. A.

Internal Grinders, Internal & External Thread Gages, Granite Surface Plates, Boring Machines

The Old Fashioned Plug Is Out Moded

In This Fast-Rolling MODERN Age

Users everywhere say:

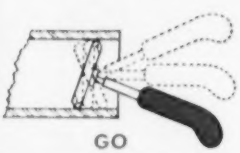
DuBo* is the MODERN Plug Gage

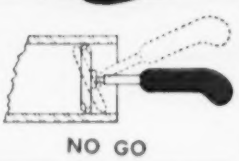
*U.S. and Foreign Patents Granted

Gaging Surfaces are Portions of a Sphere

Operates by Tilting Handle

Whether handle will drop freely or not is the definite yes-or-no indication. No guesswork, no forcing, no fumbling!





COLOR Gives INSTANTANEOUS "FOOL-PROOF" INDICATION of GO and NO GO

For Quality Control

NO plug gage can equal DuBo

. . . IN ACCURACY

. . . IN EASE OF HANDLING

. . . IN SENSITIVITY

. . . IN LIGHT WEIGHT

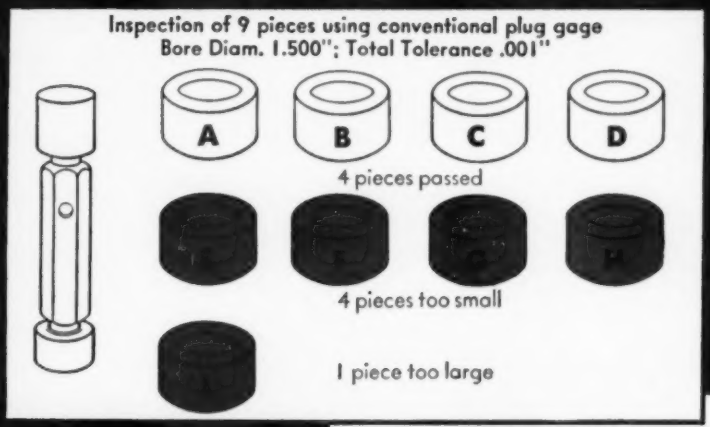
. . . IN LONG TERM SERVICE

. . . IN COST SAVING AND PROFIT

Like so many items of modern design, DuBo Plug Gage *looks* different and *feels* different from the conventional plug gage. And even craftsmen of the old school, used to time-worn methods, quickly get the feel and take pride in the use of this *different* tool. *Added to that are the many actual cases where DuBo, after a fair trial, has replaced conventional plug gages.*

With exceptional ease of handling, DuBo gives a precise, definite and sensitive check of bore diameters, directly and with no element of confusion, even in unskilled hands. In the same application, DuBo reveals dimensional variations such as taper and out-of-round which ordinary plug gages cannot indicate.

An ABC Demonstration of DuBo* Plug Gage Superiority



RESULTS of same inspection using DuBo Plug Gage

Of the 4 pieces passed by conventional plug gage above, only 3 are actually within specified limits when inspected with the more sensitive DuBo plug gage.

DuBo reveals piece D (passed above) is too large.

Of the 4 rejected as too small by conventional plug gage, E and F are actually within the limit when inspected with DuBo plug gage.

I, rejected by conventional gage as too large, is so verified when inspected with DuBo plug gage.

Of nine pieces inspected, DuBo reclaimed two false rejects and rejected one piece that had been passed by ordinary plug gage inspection. Apply even a fraction of this ratio to a day's production in your own plant and you'll realize the advantage of using DuBo Plug Gages.

COST-SAVING FACTORS

DuBo Plug Gages outlast ordinary plugs many times. Extremely light in weight (in the larger sizes, 70% to 80% lighter than cylindrical plug gages of equivalent diameter) and requiring no jockeying into position for entry, DuBo effects economies in that important cost item, actual inspection time.

Use DuBo for Precision Plug Economy

When inspecting parts under quality control sampling procedure, it is important that those parts which may be close to either end of the tolerance range be properly classified. The definiteness and simplicity of DuBo gaging is a decided advantage in this type of inspection. Anyone who has tried to enter a cylindrical plug into a hole only .0001" larger than the gage, knows how difficult it is. For even skillful workers there is a point at which it becomes doubtful whether the bore is actually smaller than the gage size, or if it is larger and merely close. With DuBo Plug Gage, even an unskilled worker can easily enter the gage under any condition and quickly interpret bore conditions correctly. There need be no border-line cases of doubt regarding the proper classification of a bore. Use of the DuBo Plug Gage minimizes the cost of parts needlessly rejected and the expense accruing from those incorrectly passed.

TRY DuBo! Sense its craftsmanlike feel and balance. See how easily it enters, even in undersize bores . . . how gentle manipulation of the handle accurately reveals internal conditions. Use it on a *fussy* job and you'll KNOW why DuBo is replacing old time plug gages everywhere! Refer to Catalog C, Pages 18, 19, 20, 21. Or, write or phone for more detailed information.

IT'S *New* IN THE U.S.A.

ROLLS THREADS

- FASTER
- SMOOTHER
- STRONGER
- CHEAPER

than any other tool

It's the new self-opening head that saves backing-off time, produces rolled threads at rates equivalent to turning speeds with uniform precision including class 3 threads, or better.

Fette differs from other methods—the material flows in an axial direction—generates the thread ahead of the rolls without breaking grain structures. This insures full depth of thread and avoids cratered crest—for denser, smoother more wear resistant threads.

Quick and permanent diametric adjustment is easily made and rigidly held. No lead screw or follow-up cam required.

Revolving type heads in sizes $\frac{7}{16}$ to 1", non-revolving type from $\frac{1}{16}$ to $\frac{3}{4}$"—for all standard parallel thread forms.

If you roll threads, you can't afford to be without the information given in the bulletin shown. For quicker results send sample with full specifications.

ASK FOR BULLETIN FRH-53

Manufactured and Sold in U.S.A. only by

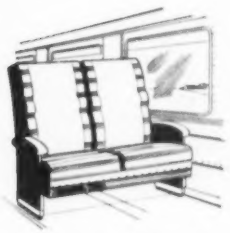
The NATIONAL ACME COMPANY

170 East 131st Street • Cleveland 8, Ohio, U.S.A.

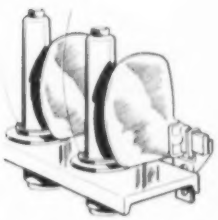
UNBRAKO BUTTON HEAD SOCKET SCREWS feature the following: threads to head; low head height; nonslip internal wrenching; hex socket that minimizes possibility of marred or mutilated heads; fully formed threads—Class 3 fit; heat treated alloy steel; standard sizes from # 8 through ⅜" diameter.

Our Fiftieth Year

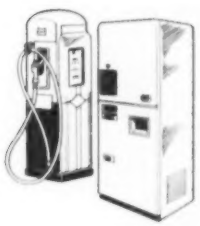
A START FOR THE FUTURE



USE UNBRAKO BUTTON HEAD SCREWS on transportation equipment—door and window frames, paneling, seats.



On textile machinery—slashers, twisters, bobbin shields.



On sheet metal assemblies—beverage coolers, gasoline pumps.

Have you checked our UNBRAKO standards?

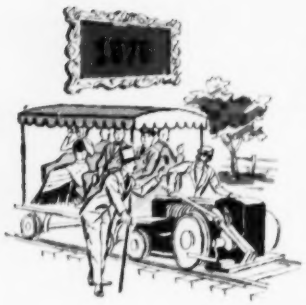
We suggest you do, because a standard UNBRAKO delivered from your distributor's stock means faster and better service. A standard will do the job as well as a special at much lower cost. For details about UNBRAKO Standards, write SPS, Jenkintown 1, Pa.

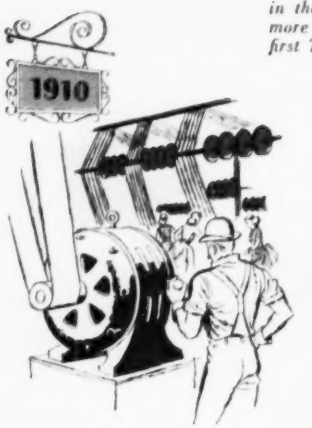
Write for UNBRAKO Standard

UNBRAKO® SOCKET SCREW DIVISION

sps JENKINTOWN PENNSYLVANIA

1878: *Thomas Edison builds an electric motor for his Menlo Park "Express."* . . . **1910:** *G.E. establishes motor leadership in the infant electric industry.* . . . **1925:** *G.E. adds 4 times more power per pound as it develops newer models.* . . . **1939:** *first Tri-Clad motor sets 14-year standard.*





General Electric Announces...

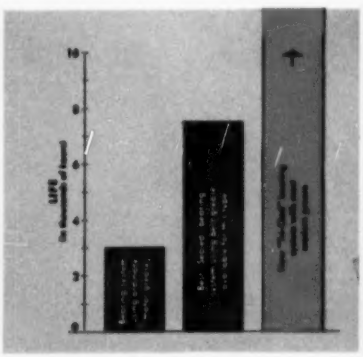
A NEW MILESTONE IN MOTOR HISTORY

New TRI 55 CLAD motor climaxes 75 years of engineering leadership

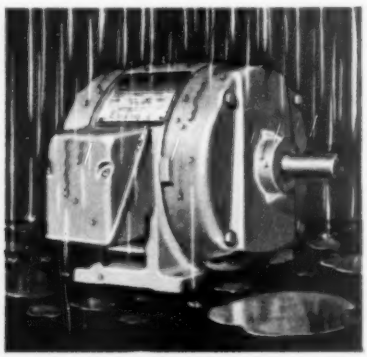
The General Electric Tri/Clad '55' is an important milestone in motor history. For this is a *completely new motor.* Born out of thousands of engineering man-hours, the Tri/Clad '55' incorporates design improvements that go far beyond mere modifications. Many years of pure research, the discovery of new, better materials, the knowledge of how to make better use of present materials, and improved manufacturing processes all make the Tri/Clad '55' motor the new leader in the motor field.

You as a motor user should take the opportunity to see and test this motor for yourself. Contact your nearest G.E. Apparatus Sales Office or G.E. Motor Agent and tell him you want to see the new G-E Tri/Clad '55'. General Electric Company, Schenectady 5, N. Y. 648-4

DESIGNED FOR BETTER PERFORMANCE: Tri/Clad '55' has a low noise level . . . runs cool . . . gives up to 53% increase in shaft output per pound...has higher full-load speeds.



ENGINEERED FOR LESS MAINTENANCE: 10%-life tests (such as the one shown) prove the Tri/Clad '55' bearings last longer without regreasing than any other bearing system.



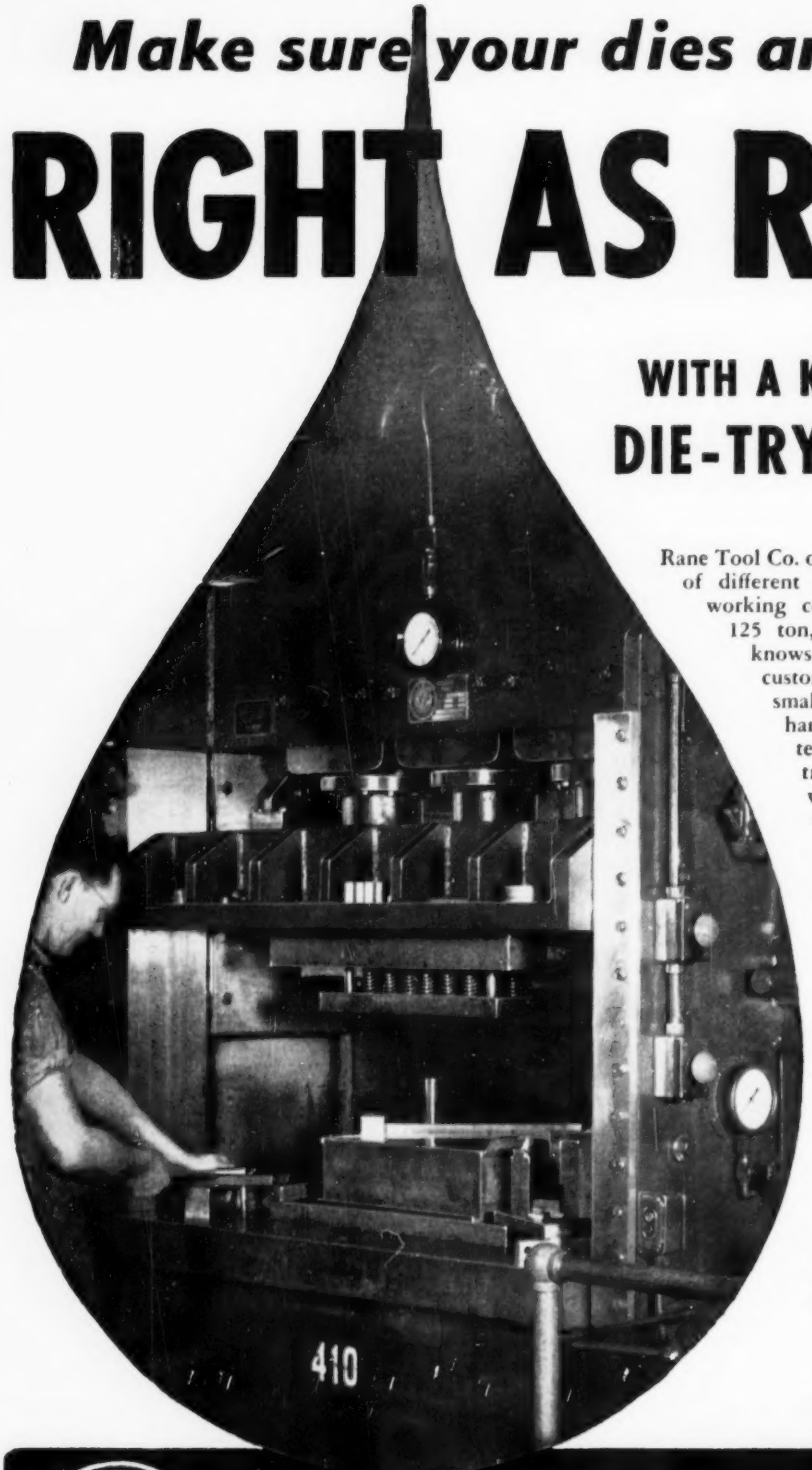
BUILT TO LAST LONGER: cast-iron strength . . . more fully enclosed dripproof construction . . . water-shedding stator windings . . . polyester film insulation 8 times stronger.

GENERAL ELECTRIC
TRI CLAD INDUCTION MOTOR
MODEL
HP
FL RPM
VOLTS
PHASE
CYCLES
FL AMP
TYPE
FRAME
TIME RATING
TRI CLAD
THE LEADER IN MODERN MOTOR DESIGN
Progress is our most important product
GENERAL ELECTRIC

Make sure your dies are always

RIGHT AS RANE!

WITH A KRW HYDRAULIC DIE-TRYOUT PRESS!



Rane Tool Co. of Jamestown, N. Y., makes hundreds of different dies for America's leading metal-working companies. Thanks to their KRW 125 ton, 3-cylinder Hydraulic press, Rane knows their dies will work perfectly in the customer's plant. Some Rane dies are small enough to fit in the palm of your hand; others are big babies that take ten men to lift. And all of them are tried out on this KRW press. It's working 95% of every day. And the Rane people tell us it's the most versatile piece of equipment in their shop.

Whether die-making itself is your business, or whether you make dies for your own production use, a KRW die-tryout Hydraulic press will soon pay for itself in time and money saved. With a KRW press in your machine shop you *know* dies will work in production before they leave the shop. There's a KRW Hydraulic press to meet any metalworking problem. 25 - 150 ton capacities, all self-contained above ground; one, two and three cylinder models; hand operated, air operated or motor driven.

Maximum size Bed and Platen on 100 and 125 ton models—40" x 60"; on 150 ton models—36" x 60".

Ask your machinery dealer to quote you or write, wire or phone Dept. 11, for full facts, prices and delivery dates.

SINCE 1916 KRW A MARK OF DEPENDABILITY

K·R·WILSON

Designers and builders of hydraulic presses to meet any metal working problem

215 MAIN STREET • BUFFALO 2, N. Y.

Why operators are dreaming of a ~~White~~ PINK Christmas

. . . Because pink CIMCOOL°—the radically new and different cutting fluid—is *one of the greatest working improvements in years.* It leaves no slippery film on shoes, floor, machine or work. It doesn't soil clothing or hands. It contains no skin irritants.

And look at some other reasons why machinists say *every day* is Xmas when Cimcool is on the job: Can't smoke. Can't burn. Virtually eliminates rancidity and foul odors. Cools so fast that tools and chips actually stay cool to the touch. And this revolutionary chemical emulsion *does a better job.*

So why not make their dream become *a reality* by switching to Cimcool? If you want proof that Cimcool *makes jobs better while doing a better job,* we'll be happy to provide a demonstration. Just write us and we'll have one of our Cincinnati Milling-trained machinists call on you—without cost or obligation. Or, if you prefer, write for our free booklet, "Cimcool Defeats Heat." Address, Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

°Trade Mark Reg. U.S. Pat. Off.

CIMCOOL

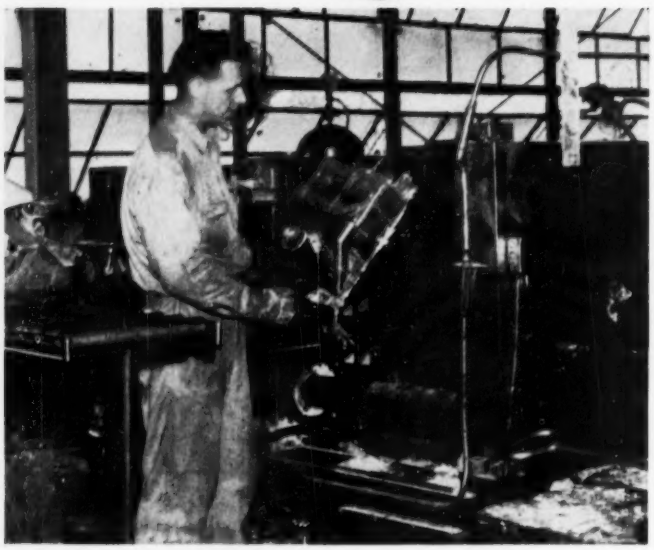
for 85% of all metal cutting jobs

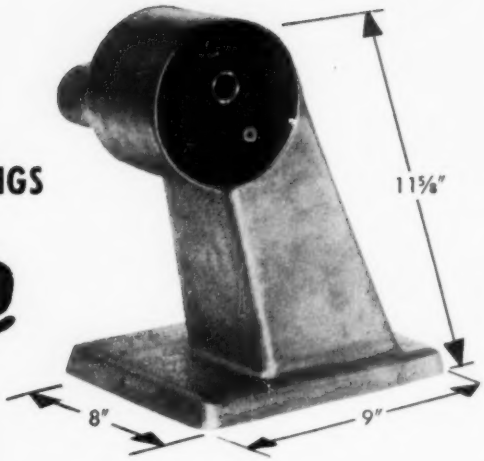
A PRODUCTION-PROVED PRODUCT OF THE CINCINNATI MILLING MACHINE CO.

PEMCO

PRODUCES ALUMINUM DIE CASTINGS

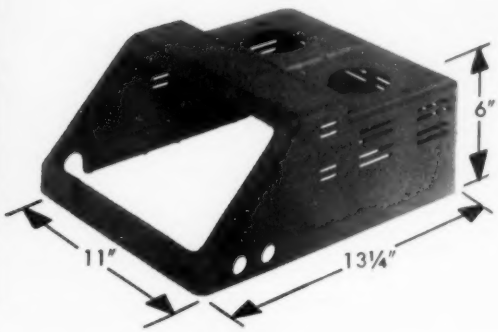
king size





8¼ LB. SHOT

Roll drive housing for electric ironer. Produced for Bendix Home Appliance Co., South Bend, Ind. Finished casting weight is 6.9 lbs.



4¼ LB. SHOT

Tape recorder housing cast for Permoflux Corp., Chicago, Ill. Photo at left shows operator removing the as-cast housing from the Cleveland Model 400 Die Casting Machine. Finished casting weight is 3 lbs.

WITH CLEVELAND MODEL 400 DIE CASTING MACHINES

The two castings shown above are typical of the top quality output of Product Engineering and Manufacturing Corp., Bridgman, Michigan. And like many other leading die casters, the mainstay of PEMCO's casting production are Cleveland Model 400 Die Casting Machines.

With the Cleveland Model 400's tremendous die locking pressure, high-speed shot injection, and rapid die closing and opening action, PEMCO receives a continuous flow of dense, hardware finish castings at a highly profitable rate of production.

Let Cleveland's time-proved leadership in die casting machine design give your die casting department or shop the same dependable performance—on zinc and aluminum castings—large and small—simple and complex. Ask a Cleveland sales engineer to show you the many Cleveland Model 400 advantages. For information on machine design details and specifications, write for Bulletin 400.

Remember: *Clevelands Cut Costs*

THE CLEVELAND AUTOMATIC MACHINE COMPANY

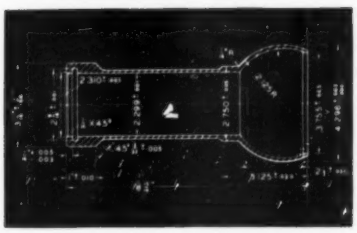
4928 Beech Street
Cincinnati 12, Ohio

SALES OFFICES: CHICAGO
CLEVELAND • DETROIT
HARTFORD • S. ORANGE

Manufacturers of a Complete Line of Single Spindle Automatic Screw Machines and High Pressure Hydraulic Die Casting Machines

Gift Wrapped—

A Customer's Job-Proved View of the Mona-Matic



BALL HOUSING (left): Fabricated steel. Turn ball and opposite end diameter; bore and form internal groove. Limits ±.001". Replacing battery of 4 machines, Mona-Matic raised production from 150 to 260 parts per day. **SLEEVE** (right): Steel. Bore and internal chamfer both ends. Production increased from 20 to 70 parts per hour.

Gift? Here are the facts, the job and the results. You decide what you'd think, if it were your job!

The National Machine Works, Oklahoma City, produces a fine drive shaft housing repair kit, consisting of a steel sleeve and ball housing (see details, left). Previously, 4 machines—4 operators—were required.

Now, thanks to the Mona-Matic's built-in gift for boosting output (plus savings on setup, form tools, tool change and grinding) this happy user is not only handling production with *one* machine, but has also materially increased production. If that doesn't strike you as a gift, consider this fact—this Mona-Matic, not even operating full time, has *paid for itself in less than one year!*

The Monarch Mona-Matic, briefly, is a fully automatic cycle, high-speed, Air-Gage Tracer controlled, single running tool turning machine —easily set up, extremely accurate, with infinite feed range and integrated rear carriage. It is furnished in a variety of versions, all proved in both long and short runs.

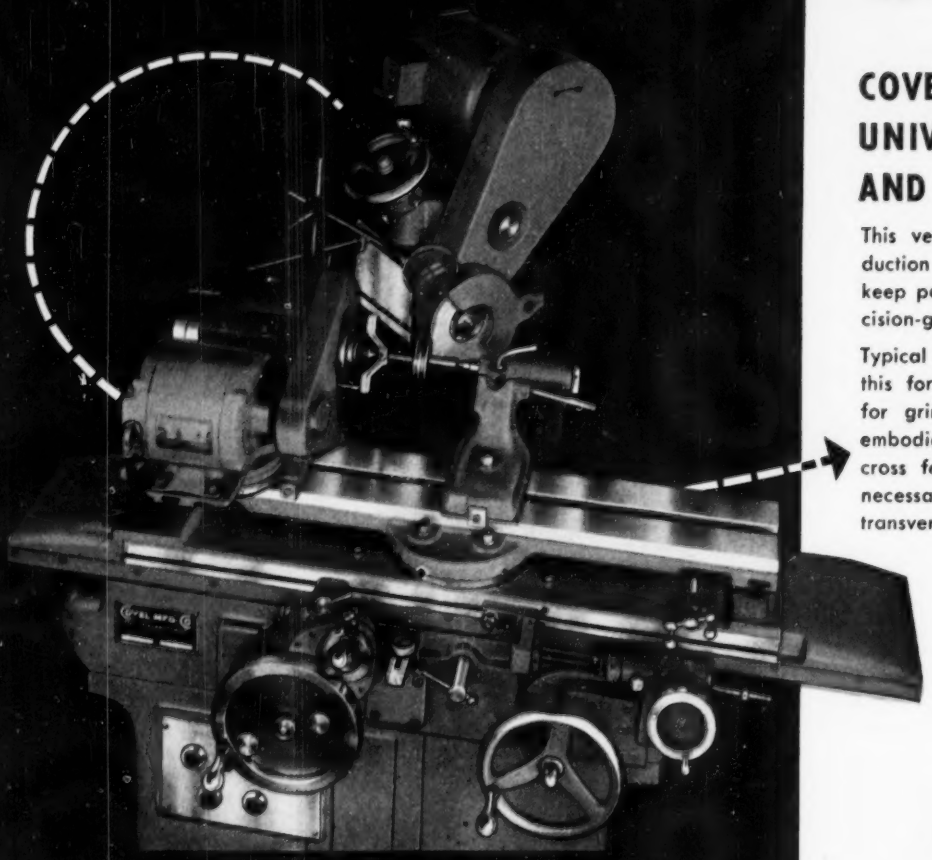
We've prepared Booklet #1805 giving the full story of the Mona-Matic—complete with data, specifications and many other job reports. Even if you don't believe in gifts, there's no time like the present! Write now . . . *The Monarch Machine Tool Company, Sidney, Ohio.*

Monarch

ACCURACY • ECONOMY • LONG LIFE

TURNING MACHINES

FOR A GOOD TURN FASTER . . . TURN TO MONARCH



COVEL NO. 12 UNIVERSAL CUTTER AND TOOL GRINDER

This versatile machine can get production off to a flying start — and keep pace with a steady flow of precision-ground, highly efficient tools.

Typical of No. 12's *universal* scope is this form grinding attachment set-up for grinding circular form tools. It embodies fine longitudinal feed—fine cross feed; for the extreme accuracy necessary for both longitudinal and transverse movement.

Write for
12-page detailed
Bulletin A-253

PRODUCTION *Starts* IN THE TOOL ROOM

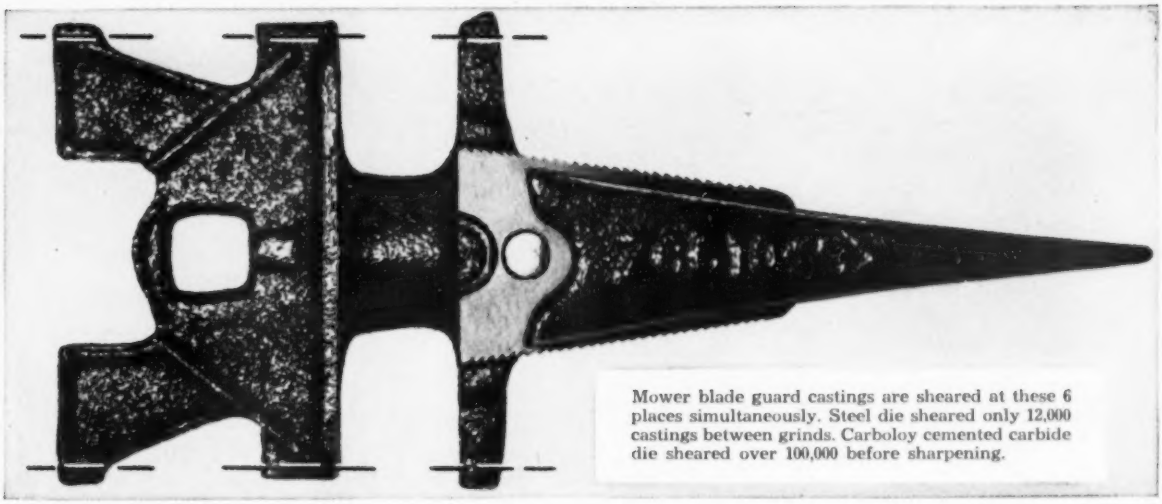
Look to your tool room — where production starts — and see whether your tool-makers and set-up men are hampered by obsolete, inaccurate and wasteful grinding equipment. Poorly ground tools and cutters handicap production every step of the way — through inferior results, costly rejects, loss of valuable time, expensive tool waste.

If your cutter and tool costs *are* high, perhaps you are *paying* for Covel quality without enjoying its many profit-saving advantages . . . and if so, now is the time to call on Covel for the answer. We will be pleased to send complete information.

80 YEARS of continuous manufacturing experience makes your COVEL choice a sound one

COVEL PRECISION GRINDERS
BENTON HARBOR, MICHIGAN

DRILL GRINDERS • UNIVERSAL CUTTER & TOOL GRINDERS • HYDRAULIC & HAND FEED SURFACE GRINDERS



Mower blade guard castings are sheared at these 6 places simultaneously. Steel die sheared only 12,000 castings between grinds. Carboloy cemented carbide die sheared over 100,000 before sharpening.

OLIVER CORPORATION REPORTS—

Carbide inserts increase die life over 800%!

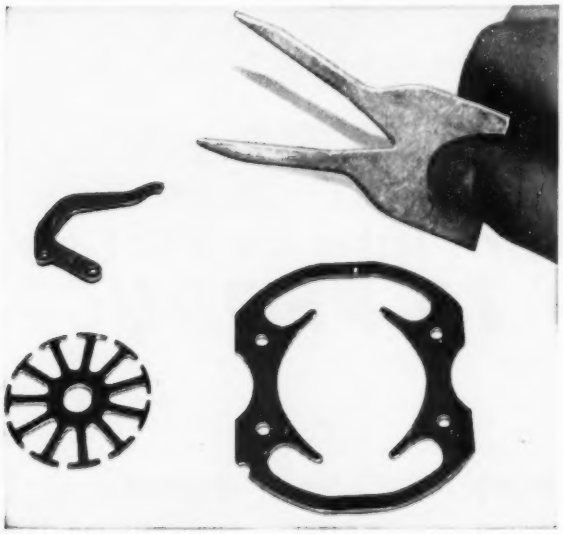
Carboloy cemented carbide on cutting edges of trim block shearing die increased production from 12,000 to well over 100,000 pieces between grinds!

When the Oliver Corporation switched from a steel die to a die equipped with Carboloy cemented carbide, things happened!

Carbide's stay-sharp-longer feature increased trim block life from one day to more than 8 days between grinds. It increased production, lowered maintenance costs, cut rejects, slashed downtime. There was no chipping or cracking of carbide under continuous impact; little grinding was needed to restore cutting edge.

Perhaps you have a die job – simple or complex, large or small – where you can get the same benefits. If so, have a Carboloy representative stop at your plant, show you how easily Carboloy cemented carbides can be profitably applied to almost any blanking, forming, drawing or piercing die.

Send coupon for free Carboloy Die Engineering Manual D-124 containing details on carbide applications.



Typical parts being produced by industry on carbide dies. Dies of Carboloy cemented carbide outlast steel dies 10 to 50 times. Produce burr-free, close tolerance parts with a minimum of maintenance and downtime.

"Carboloy" is the registered trademark for the products of the Carboloy Department of General Electric Company

CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY

MAIL TODAY

CARBOLOY Department of General Electric Company
11149 E. 8 Mile Street, Detroit 32, Michigan

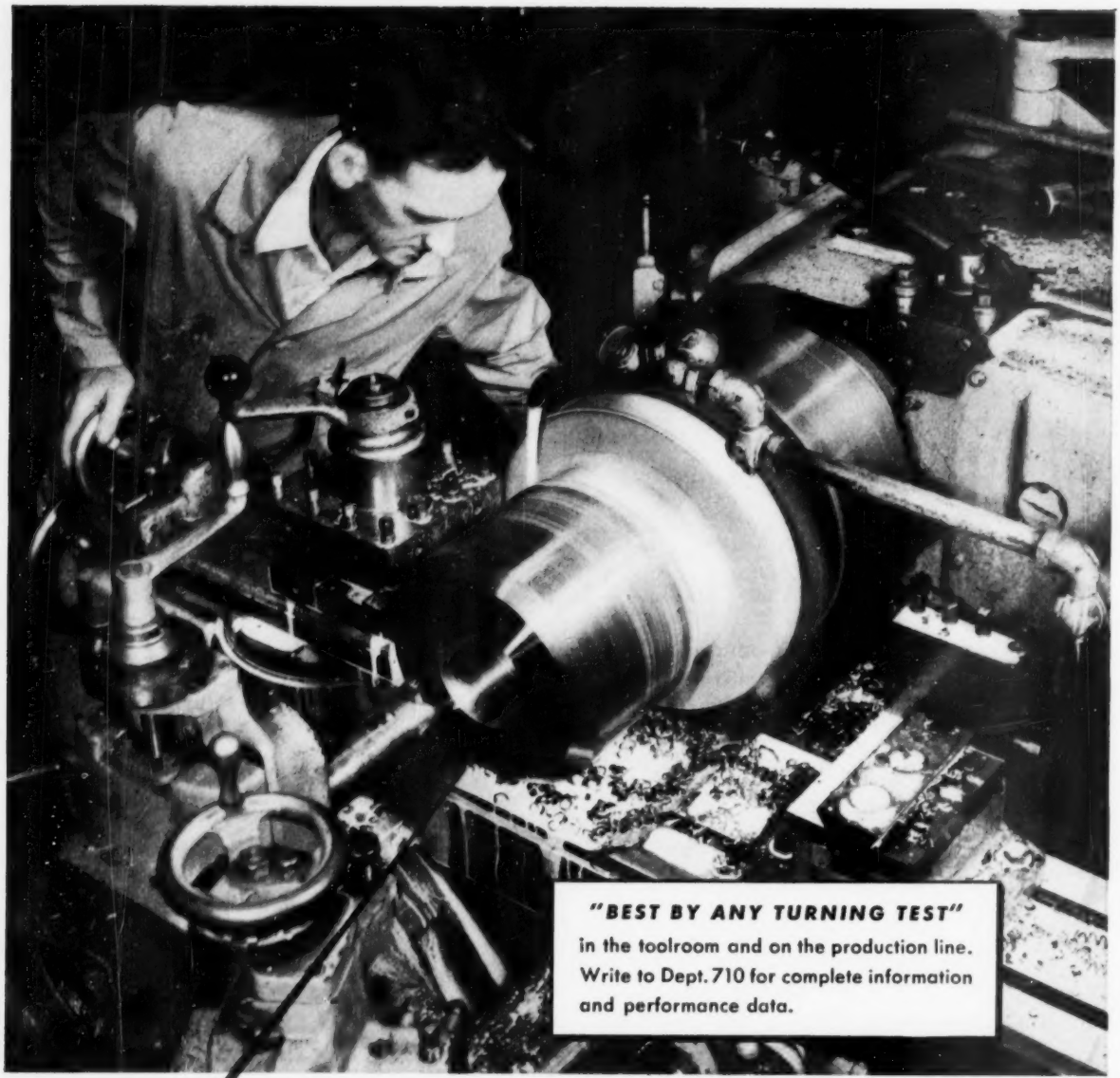
Gentlemen:
- ☐ Send me, free, your helpful Die Engineering Manual D-124.
- ☐ Have a Carboloy representative call at my plant.

Name _____ Position _____

Company _____

Address _____

City _____ Zone _____ State _____


"BEST BY ANY TURNING TEST"
in the toolroom and on the production line.
Write to Dept. 710 for complete information
and performance data.

Jones & Lamson turret lathes are BUILT and

POWERED TO PRODUCE

MORE CHIPS **per tool**
MORE PIECES **per hour**
MORE PROFIT **per job . . . than any turret lathe of comparable size!**

JONES & LAMSON

Machine Tool Craftsmen Since 1835

JONES & LAMSON MACHINE CO., 502 Clinton St., Dept. 710, Springfield, Vt., U.S.A.

J&L TURRET LATHE DIV.

WHY IT PAYS TO BUY STEEL FROM WAREHOUSE

You don't need to freeze money in inventory!

WHEN YOU BUY STEEL FROM WAREHOUSE, YOU GET:

- LOWER INVENTORY COSTS
- LOWER SPACE COSTS
- LOWER TIME COSTS
- LOWER CAPITAL INVESTMENT
- FASTER PRODUCTION
- FEWER INVENTORY LOSSES

LET your U. S. Steel Supply warehouse serve as your inventory stock. Then you eliminate from your overhead the cost of carrying your own inventory, and free a substantial portion of your capital for other purposes. U. S. Steel Supply can always deliver the steel you want to your plant or job site at the time you specify. Just tell your U. S. Steel Supply salesman what you want . . . when . . . and where.

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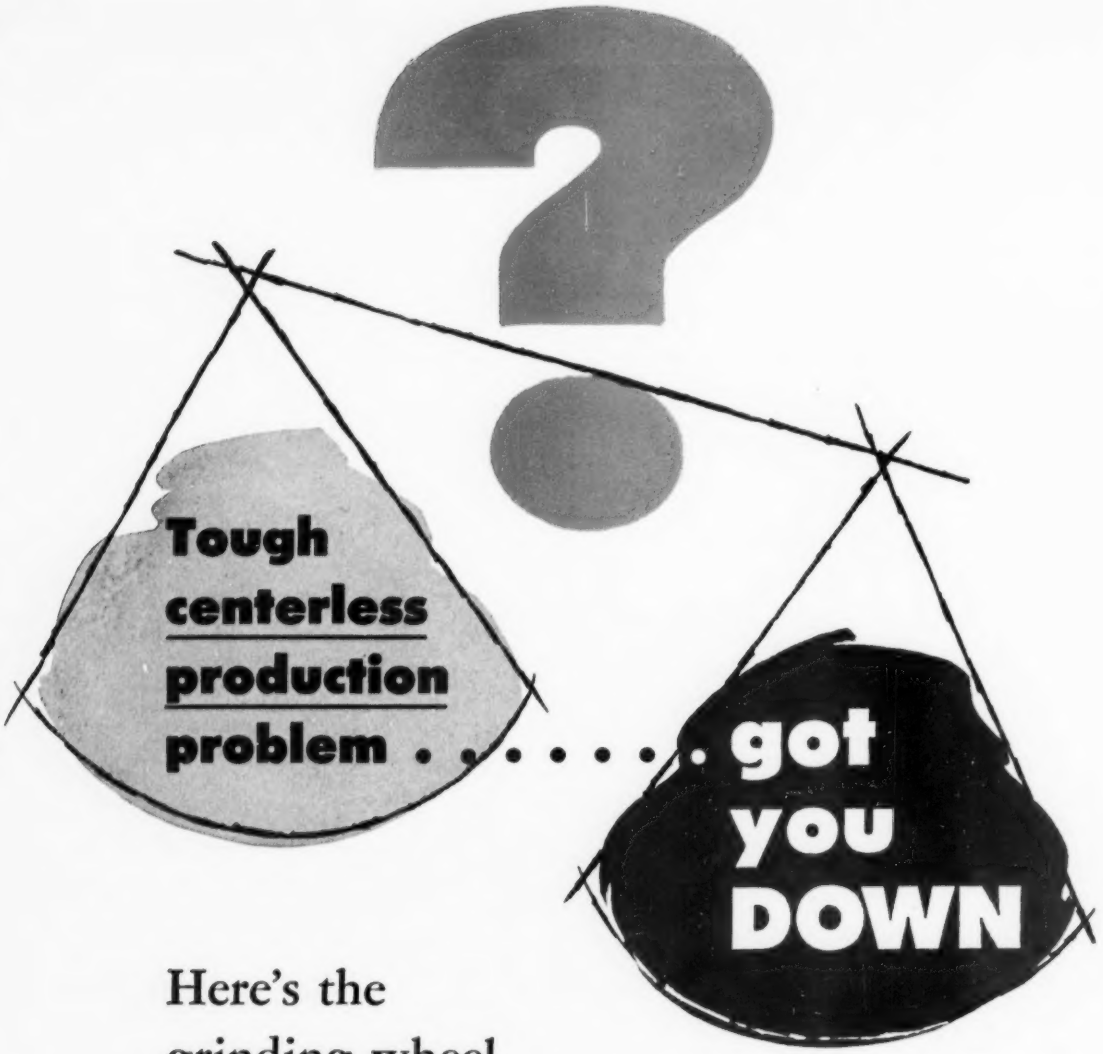
UNITED STATES STEEL



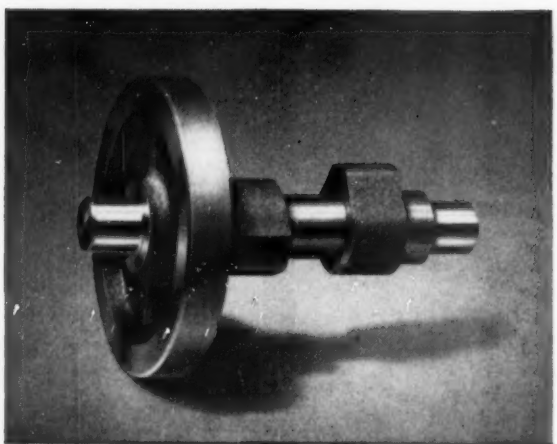
Here's the grinding wheel that will ABSOLUTELY solve it!

Here's why a CINCINNATI Grinding Wheel is *the smartest solution to tough production problems* in centerless grinding:

BECAUSE CINCINNATI WHEELS ARE MADE TO TEAM-UP WITH CENTERLESS GRINDERS

What's more, with a Cincinnati Milling-trained machinist on the spot to help you get the most out of CINCINNATI Grinding Wheels, you can count on the *right answer* – FAST!

And here's why we're so *positive* that CINCINNATI Wheels can help you:



Increasing production in grinding, while maintaining close tolerances, of this gear cam for an internal combustion engine presented difficult problem. For full story—and solution—see Case History at upper right.

1 CINCINNATI Grinding Wheels are used by—and *developed* by—Cincinnati Milling, which has done more research, had more experience and made more centerless grinders than any other organization in the world.

2 We've solved hundreds of centerless grinding problems using CINCINNATI Grinding Wheels. These problems have not been confined to production. They include a complete variety of centerless grinding troubles—such as roundness, taper, sizing, stock removal and finish.

Research worker shown here is using special equipment to check grinding wheel wear. This equipment gives consistent measurement of changes in wheel radius within .00005"

3 CINCINNATI Grinding Wheels represent 25 years of Cincinnati Milling research and practical experience on an entirely new approach to grinding wheels—the development of the grinding wheel as a true cutting tool.

How CINCINNATI Grinding Wheels Solved Tough Centerless Production Problem

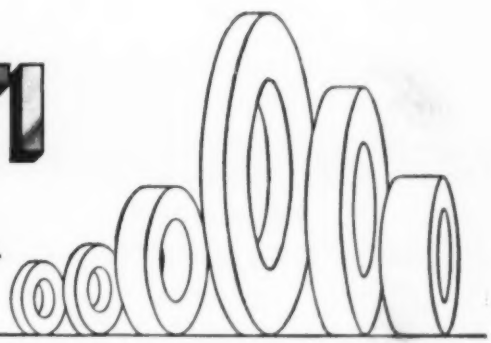
CASE HISTORY No. 387

The job	Centerless grind by infeed method a spur gear and cam blank for internal combustion engine. Material — cast iron, 160-220 Brinnell. Stock removal — .005". Two diameters of .5000" and .4995", length 1/2" at each end, finish 15 RMS maximum, radius .025" maximum.
The machine	New Cincinnati # 2 Centerless.
The problem	Customer wanted to remove stock, maintain finish, hold .0002" for roundness, .0005" for size and grind at a rate of 125 pieces per 50-minute hour — in one pass.
The solution	Cincinnati Grinding Wheels machinists studied the problem and discussed it with production men and machine tool men. The result of this close cooperation was another notable solution to a difficult problem. Spacing between grinding wheels is critical because of the necessity for grinding extremely close to the shoulders on the part. The grinding wheels are ground on sides so that when used with a specially ground spacer the dimension between wheels can be held to plus .006". The wheels prescribed were two Cincinnati 2A100-W6-VL Wheels. The customer was able to grind 150 pieces per hour and hold 12 RMS finish. Three hundred pieces are ground between wheel dressings.

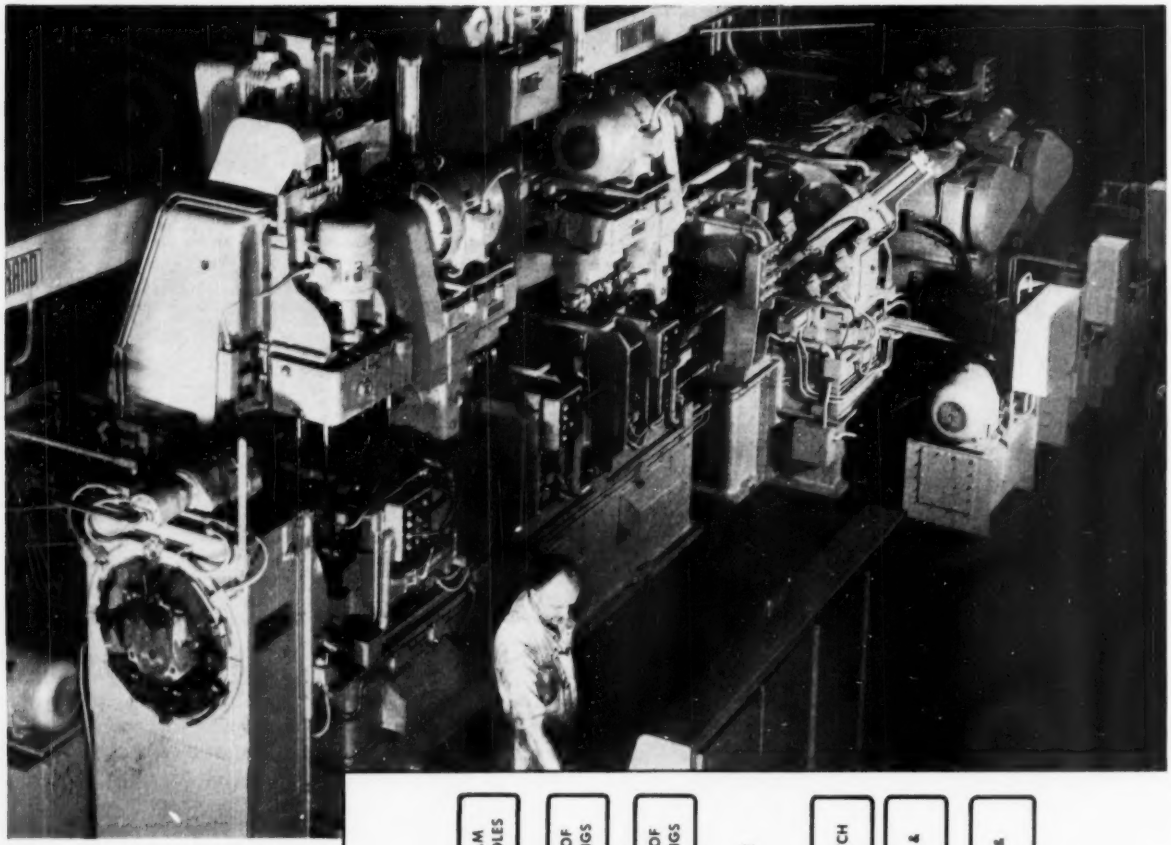
We are so confident—*so absolutely sure*—that CINCINNATI Grinding Wheels can help solve your tough centerless production problem that we make this *unconditional offer:* Either you must be completely satisfied, or we will make no charge for the CINCINNATI Grinding Wheel used.

So contact us at once. We'll send one of our expert machinists—men who are Cincinnati Milling-trained and know grinding and grinding machines as well as grinding wheels. He can show you how to get the most out of CINCINNATI Grinding Wheels and help you solve that tough centerless production problem. There is no charge for the service of this expert machinist. Write, wire or phone Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

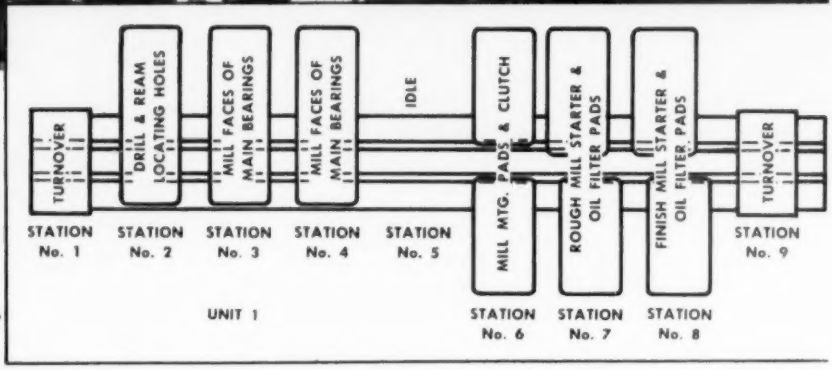
CINCINNATI
Grinding Wheels
THE CINCINNATI MILLING MACHINE CO.
Cincinnati 9, Ohio



Another Example of SUNDSTRAND



12 Station Process Line for Cylinder Blocks

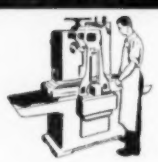


Whether processing several parts over one machine or one part through several machine elements, as shown above, Sundstrand "Engineered Production" results in the most economical method of machining to meet the job at hand. It consists of determining the most profitable and productive processing method first, then, providing the machines to suit this method — standard or semi-standard

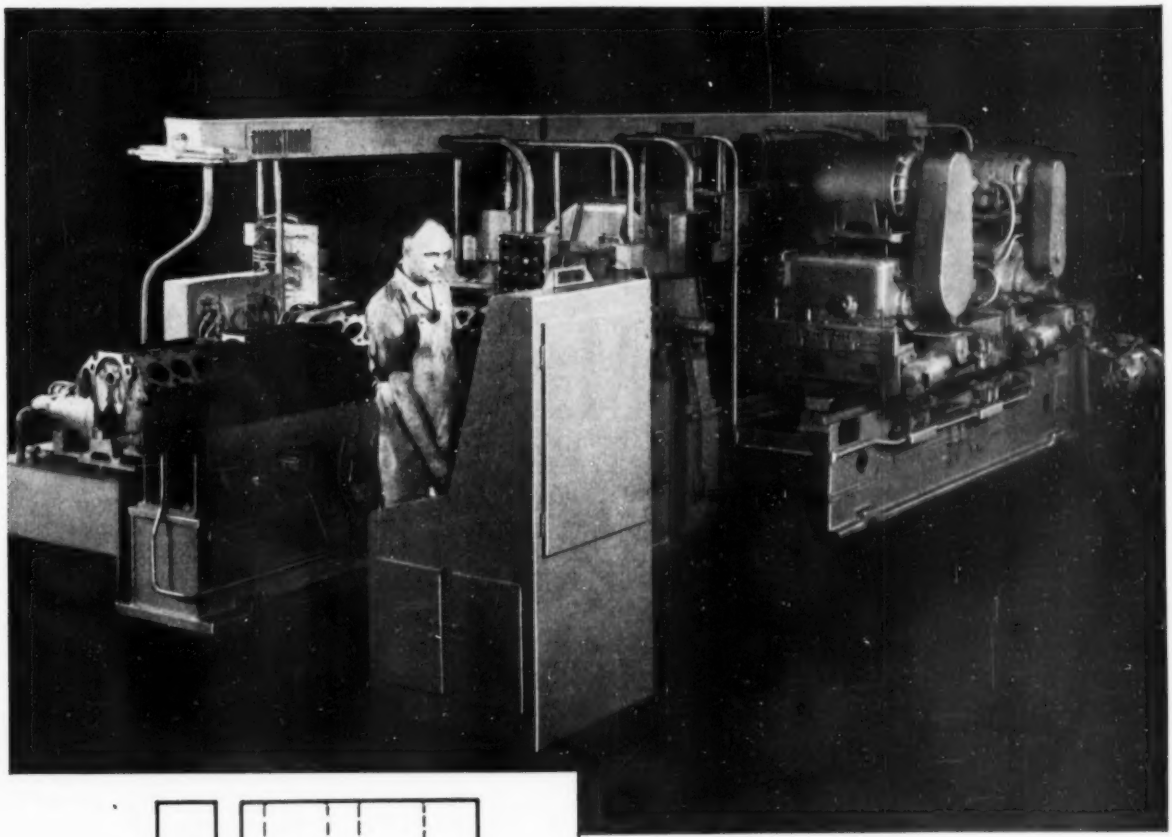
AUTOMATIC LATHES | SIMPLEX RIGIDMILS | DUPLEX RIGIDMILS

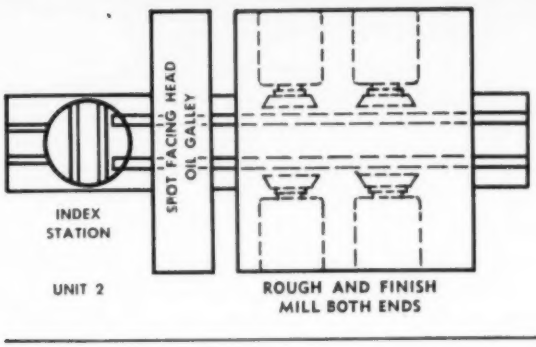
SUNDSTRAND "Engineered Production" Service*

*REG. U.S. PAT. OFF.



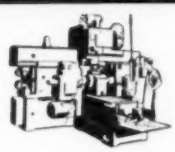
"ENGINEERED PRODUCTION"

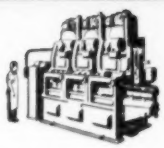




machines, if possible, or entirely special machines, if necessary. This special Sundstrand 12 station transfer type machine is a good example of the results of Sundstrand "Engineered Production" Service. The drawings and photos show the two units which are joined together in the production line. Cylinder blocks are automatically handled from incoming to outgoing end of machine for operations as indicated on drawing. Production rate is approximately 80 pieces per hour. If you have metal working operations in your plant, call in a Sundstrand Process Engineer. There is no obligation for this service.

TRIPLEX RIGIDMILS | SPECIAL MACHINES





SUNDSTRAND
Machine Tool Co.
2533 Eleventh St. • Rockford, Ill., U.S.A.

To owners of BLISS *presses:*

You can benefit 4 ways from PRESS MODERNIZATION ASSEMBLIES

Factory-Engineered Installations in Your Own Plant Minimize Downtime

Owners of older Bliss presses* may now avail themselves of individual *factory-engineered*, but field-installed conversion and modernization assemblies calculated to yield these benefits:

1. ***Reduce*** *downtime by restoring original press efficiency.*
2. ***Increase*** *productivity beyond present specifications through* new *features.*
3. ***Save*** *roughly 60% of new press replacement cost.*
4. ***Amortize*** *the low cost of these gains in one year.*

A variety of modernization and conversion assemblies have been developed from our complete engineering records. These contain original specifications and subsequent changes for all presses built during the past 50 years. Thus, each installation perfectly augments a Bliss-built press; represents "genuine" modernization, not improvisation.

If you want: faster adjustments, more working strokes per minute, fast ejection of parts . . . chances are Bliss engineers can build these and other features of today into your older presses. Performance analysis of your press and recommendations will be made without obligation.

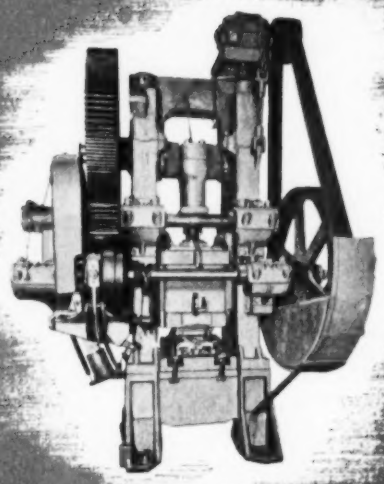
Detailed information about the 18 conversion assemblies identified on these pages is provided in Bulletin No. 45. Write for it today! Then ask your Bliss representative to show you how these modernization assemblies can be applied to *your* presses.

**and Bliss-serviced presses, including: Toledo, Marquette, Consolidated, Stiles and Cleveland Machine & Manufacturing Company.*

Yours for the asking

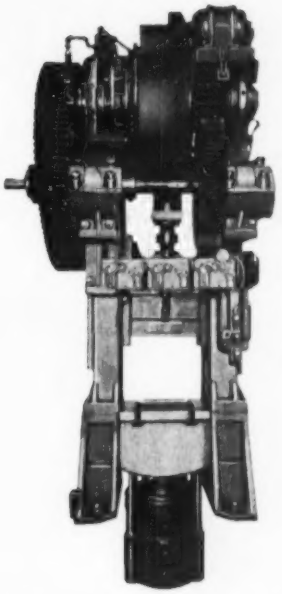
Bulletin No. 45—"Bliss Recommendations for Modernization and Conversion of Straight-Side and Gap-Frame Single Crank Presses".

BEFORE



Here is a single-action press requiring manual clutch operation. Not keyed to today's high production requirements, it occupies too much space, does not permit continuous operation and may present safety hazards to the careless operator.

AFTER



After pneumatic friction clutch and gearing modernization, it is now compact; occupies 40% less space; can be operated continuously, single-stroked, inched or stopped during any point in cycle. Operator fatigue is reduced and the safety factor is improved by electric push button controls.

Some Examples of Low-Cost Press Modernization Assemblies

Power slide adjustment for presses with manual slide adjustment.

Driveshaft roller bearing installation for presses with bronze or babbitt driveshaft bearings.

Pneumatic type slide counterbalance for presses with long strokes and heavy dies that are not equipped with counterbalance.

Spring type slide counterbalance for medium and small presses with normal slide stroke.

Pneumatic friction clutch and gearing for presses with mechanical friction clutches.

Conversion from positive to pneumatic friction clutch for presses with positive-type clutches.

Pneumatic friction clutch replacement for presses with mechanical friction clutches.

Conversion to twin end gear drive for single and gear driven presses with friction clutch drive.

Conversion from non-geared to single geared drive for non-geared presses with positive-type clutch.

Conversion to fixed inclined position for presses of fixed (usually vertical) position.

Bar type slide knockout installation for presses with slide having a knockout bar slot or slide machinable for the slot.

Bottom liftout installation for presses having a bed construction which permits installation of a bottom liftout.

Individual motor drive installation for any press driven by a line shaft or detached motor.

Pneumatic operator for mechanical friction clutch for presses with hand or foot operated mechanical friction clutches.

Pneumatic operator for positive type clutch for presses with hand or foot operated positive-type clutches.

Outside trimmer installation for presses with or without provisions for outside trimmer.

BLISS on your press is more than a name...*it's a guarantee*

E. W. BLISS COMPANY, Canton, Ohio

PRESSES, ROLLING MILLS, SPECIAL MACHINERY

E. W. Bliss (England) Ltd., Derby, England • E. W. Bliss Company (Paris), St. Ouen sur Seine, France

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Factory approved motor service in every industrial area from 101 Allis-Chalmers Certified Service Shops.

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Of course, Allis-Chalmers Certified Service Shops give good service on any electrical equipment, of any make. Tear out this ad and save it, or write the name of the A-C Certified Service Shop nearest you in your address book. Allis-Chalmers, Milwaukee 1, Wisconsin. A-4197

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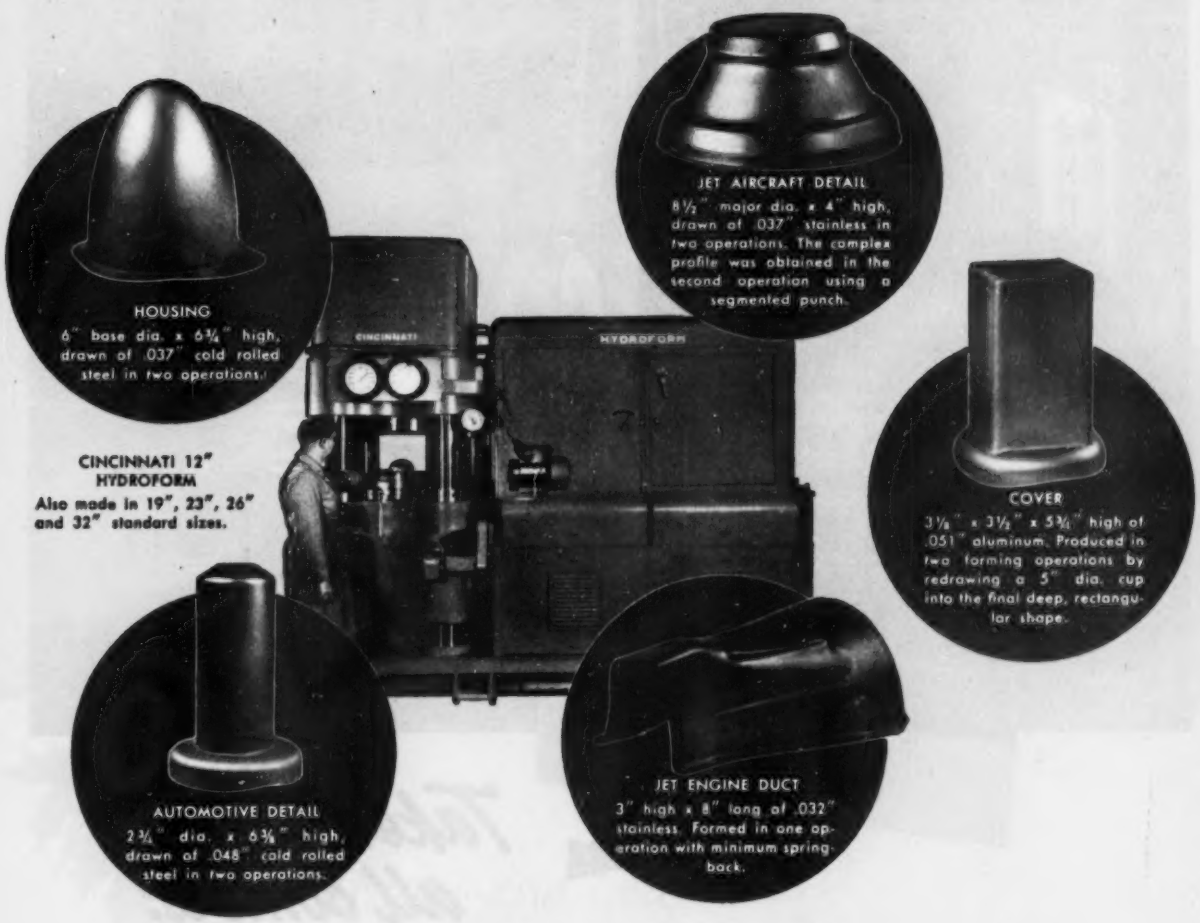
CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

TEXROPE — Belts in all sizes and sections, standard and *Vari-Pitch* sheaves, speed changers.

PUMPS — Integral types from ¾ in. to 72 in. discharge and up.

When the draw is difficult... or the tool cost per unit is excessive...


HOUSING
6" base dia. x 6¾" high, drawn of .037" cold rolled steel in two operations.
JET AIRCRAFT DETAIL
8½" major dia. x 4" high, drawn of .037" stainless in two operations. The complex profile was obtained in the second operation using a segmented punch.
CINCINNATI 12" HYDROFORM
Also made in 19", 23", 26" and 32" standard sizes.
COVER
3⅛" x 3½" x 5¾" high of .051" aluminum. Produced in two forming operations by redrawing a 5" dia. cup into the final deep, rectangular shape.
AUTOMOTIVE DETAIL
2¾" dia. x 6⅜" high, drawn of .048" cold rolled steel in two operations.
JET ENGINE DUCT
3" high x 8" long of .032" stainless. Formed in one operation with minimum spring-back.

then use Hydroforming

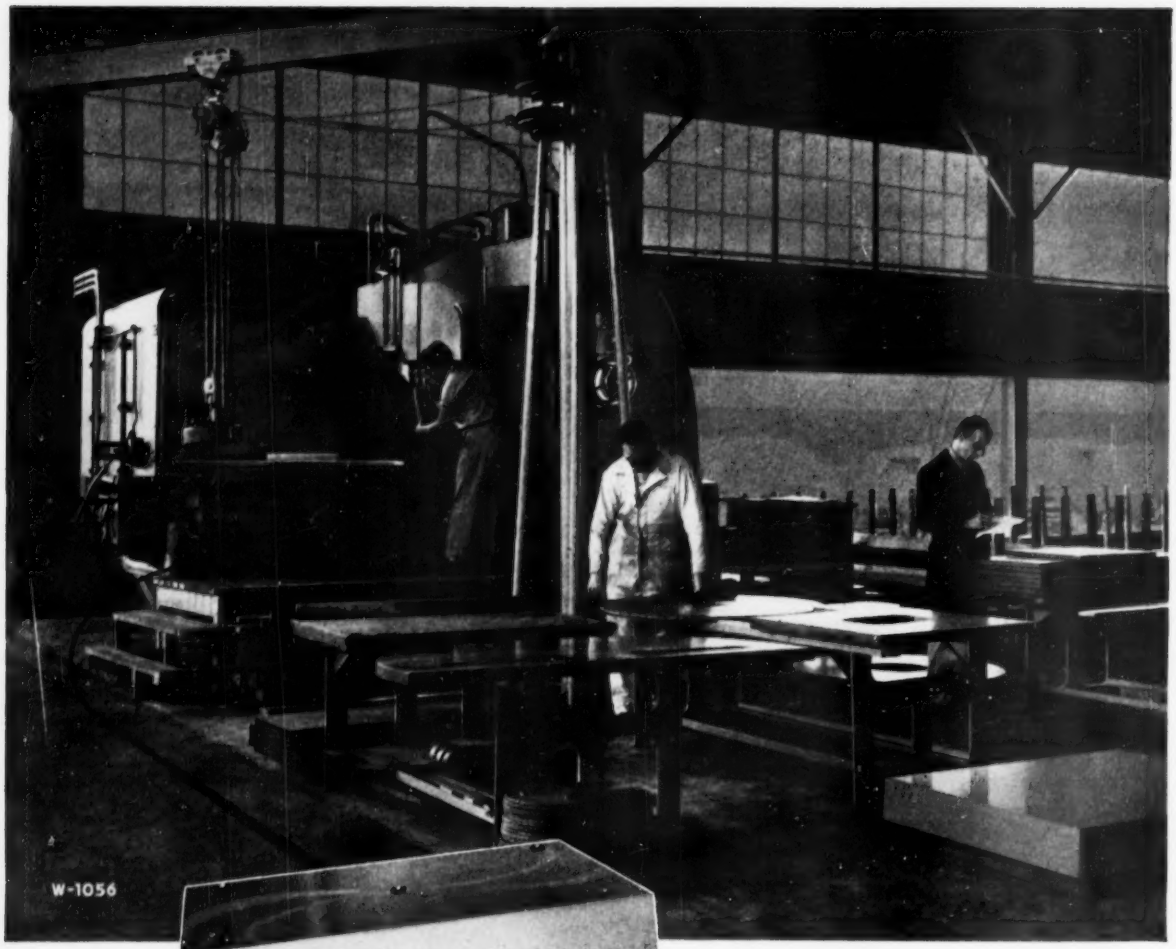
Each of the parts shown above represents a difficult drawing job made *easy* by *Hydroforming*. No more than *two forming operations* were required to produce any one part.

The combination of the Hydroform's ability to draw intricate or difficult shapes in fewer operations than conventional methods permit . . . plus the use of simple tooling that cuts tool-making time to a day or two, instead of requiring weeks or months . . . made possible *quick* deliveries of these parts at *reasonable* unit costs.

Can you utilize these Hydroforming advantages to make your manufacturing methods more efficient—more economical? Call in a Cincinnati Milling field engineer. Let him give you complete information. Bulletin M-1759-2 supplies data on the Hydroforming process as well as machine specifications. Write for your copy.

CINCINNATI Hydroform

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO, U.S.A.



Takes on all comers!

This 42-72-84 Blanchard Surface Grinder is used for machining many sizes of torch cut steel plates. As the first operation after cutting, Blanchard grinding removes the proper depth of stock as required, frequently up to ⅛" per side, producing surfaces accurately flat and parallel for laying out or further machining. Work up to 7 feet across corners is regularly ground on this machine. In spite of its size, this grinder is as easily controlled as the smaller Blanchard grinders.

Typical of work produced is the 48" x 48" x 10" machine steel, die mounting plate, at left. 58 cu. in. of stock (.025" per side) is ground off in one hour and 35 minutes, floor to floor, with flatness held to .001". Note the magnetic hoist —a good tip for loading and unloading the Blanchard quickly.

Regardless of your requirements for stock removal, tolerances or surface finish, Blanchard has the grinder and grinding wheel to do each job best.

Send for your free copies of "Work Done on the Blanchard," fourth edition, and "Art of Blanchard Surface Grinding."

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY **64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.**

to you-and you —
and especially You

With the approach of the Holiday Season we all look forward to the year ahead — pause and reflect on the one just closing. Regardless of our accomplishments we all resolve to do a better job in our respective fields of endeavor. You, too, can do a better job in '54 and many years ahead with Bullard Machine Tools illustrated on the following page.

BULLARD

THE BULLARD COMPANY BRIDGEPORT 2, CONNECTICUT

Specify BULLARD MACHINE TOOLS

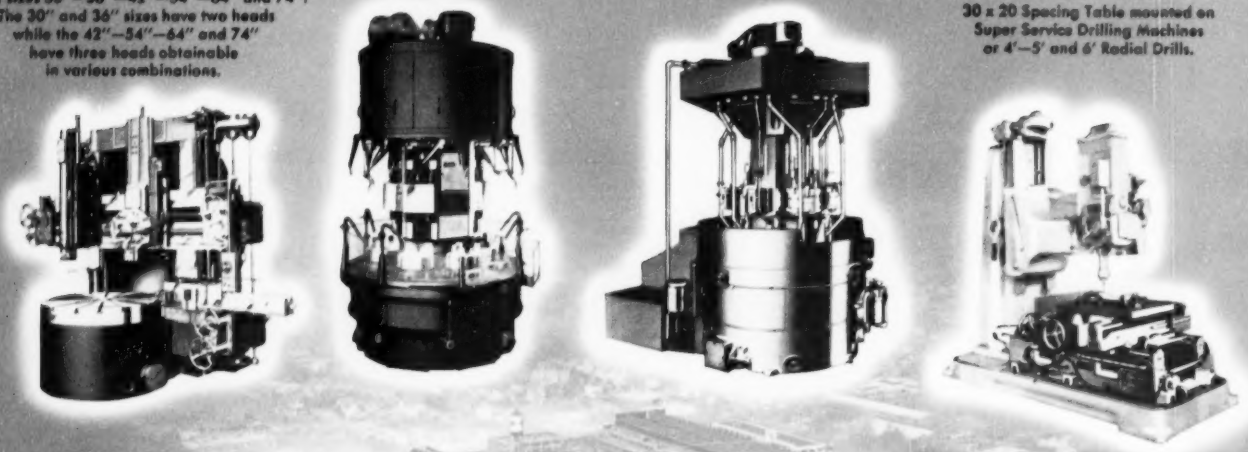
for greater manufacturing economy and efficiency.....

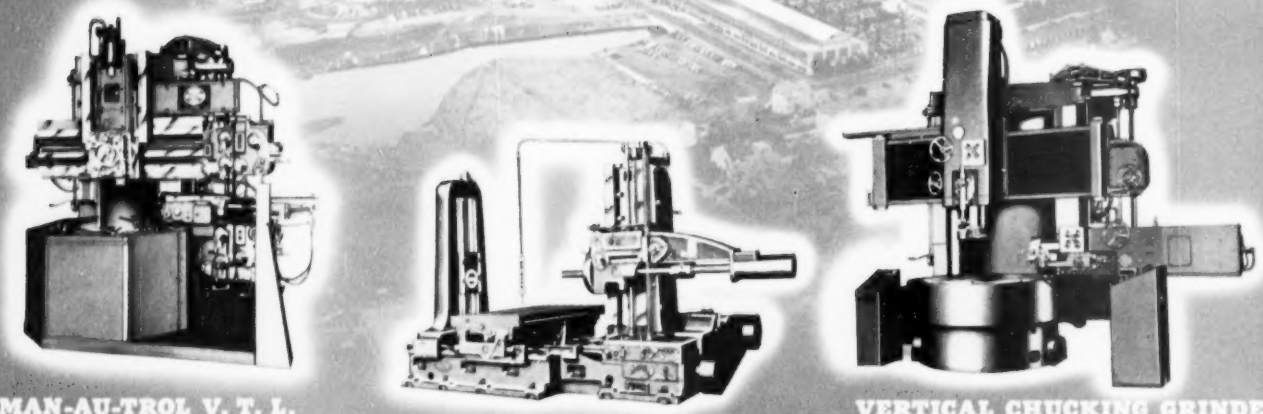
MULT-AU-MATIC
Type "D" — 8"—12"—16" with 6 or 8 Spindles, Type "D" 16-23" and Type "K" 6 Spindles — and 6 twin Spindles — 8 Spindles and 8 twin Spindles.

CONTIN-U-MATIC
Type "KD" with 4-6 or 12 spindles. Sizes 10"—14"—20".

CUT MASTER V. T. L.
In six sizes 30"—36"—42"—54"—64" and 74". The 30" and 36" sizes have two heads while the 42"—54"—64" and 74" have three heads obtainable in various combinations.

SPACING TABLE
30 x 20 Spacing Table mounted on Super Service Drilling Machines or 4'—5' and 6' Radial Drills.





MAN-AU-TROL V. T. L.
In six sizes 30" and 36" with two heads. 42"—54"—64" and 74" with three heads.

HORIZONTAL BORING, MILLING AND DRILLING MACHINE
4" and 5" Spindle with various bed lengths and post heights.

VERTICAL CHUCKING GRINDER
Six sizes, 30" to 74" are available with a variety of head combinations.

THE BULLARD COMPANY
BRIDGEPORT 2, CONNECTICUT

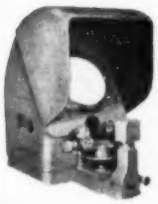
Sales offices in: Chicago, Ill.; Milwaukee, Wisc.; Rock Island, Ill.; Cleveland, O.; Dayton, O.; Pittsburgh, Pa.; Detroit, Mich.; Indianapolis, Ind.; South Bend, Ind.; Boston, Mass.; Philadelphia (Narberth), Pa.; Syracuse, N. Y.; and Bridgeport, Conn.

Distributors in other principal cities in the United States, Canada and throughout the world.

11 MODELS

3 SCREEN SIZES

Pedestal Type
14" Diam. Screen



Bench Type
14" Diam. Screen
4 Models

Bench Type
5¾" x 7¾" Screen
3 Models

Unsurpassed Inspection Versatility

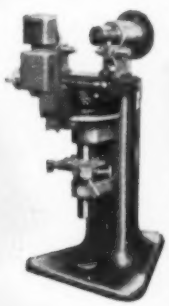
JONES & LAMSON OPTICAL COMPARATORS

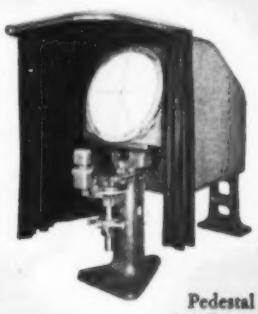
The Essence of Quality Control

Jones & Lamson Optical Comparators are designed and built like rugged machine tools to withstand vibration and hard use. Yet they have the built-in accuracy to satisfy the most exacting laboratory standards.

- **They meet** the requirements of toolroom, laboratory and production inspection.
- **They precisely measure** height, depth, lead or spacing, as well as angles to degrees and minutes. They will measure to .0001".
- **They compare** intricately contoured parts with a master outline—and measure the amount of error.
- **They are convenient** to operate, easy to set up and read direct—*without computation.*
- **They operate** under normal lighting conditions. *No darkroom is needed.*
- **They will photograph** the enlarged shadow and record its relationship to a master chart.
- **Several persons** may study the shadow *at the same time.*
- **They will inspect** and measure surface contours, as well as profiles of objects such as type faces, stamping dies, punches, worn tools, etc.

Vertical Type
14" Diam. Screen





Direct Projection Type

Pedestal Type
30" Diam. Screen

P.S. A complete line of STANDARD CHARTS and FIXTURES is maintained by us.

Jones & Lamson Machine Company
502 Clinton Street, Dept. 710
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Please send Comparator Catalog No. 402.

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JONES & LAMSON

JONES & LAMSON MACHINE COMPANY
502 Clinton St., Springfield, Vt., U.S.A.

Machine Tool Craftsmen Since 1835

COMPARATOR DIV.
Dept. 710

If YOU've got it to grind...

CARBO

TRADE

"Carborundum" is a registered trademark which indicates manufacture by The Carborundum Company, Niagara Falls, New York

WE've got it to grind with!

You get UNBIASED COUNSEL based on all abrasive methods

Your business, in mass production of parts or finished assemblies, is the problem of generating close tolerance sizes, of producing high surface finishes, of removing stock. The business of CARBORUNDUM is the exclusive ability to recommend and furnish you the specific type of abrasive product which will give you highest quality at lowest cost, on every operation you perform.

For instance, take portable grinding. You can choose from at least 9 different methods of grinding with portable equipment. You're looking for the best, most economical method for your needs. How can you be *sure?* By asking CARBORUNDUM...for CARBORUNDUM alone has a complete, branded line of grinding wheels *and* abrasive belts *and* tumbling and polishing grains...and only CARBORUNDUM can recommend without bias, on the sole basis of what's best for you.

Or perhaps you manufacture kitchen knives. You might use grinding wheels or abrasive belts or *both* to grind the edges and bolsters...finish the handles...or sharpen the blades. You could use abrasive grain on set-up wheels, or abrasive belts, to finish and polish. CARBORUNDUM alone can give you *one-source control* of abrasive quality, on every type of abrasive you use...quality that's constant, identical, dependable—thus economical.

Several ways to do one operation? Call in CARBORUNDUM. Several processes on one part? Call in CARBORUNDUM. Either way, you win.

Call your CARBORUNDUM *Salesman or Distributor* today!

He's your best bet for complete stocks, prompt delivery...and best of all, experienced counsel on *every* new development in the *entire* field of abrasives. He's in the yellow pages under "Abrasives" or "Grinding Wheels." Phone him today—it's to your profit!

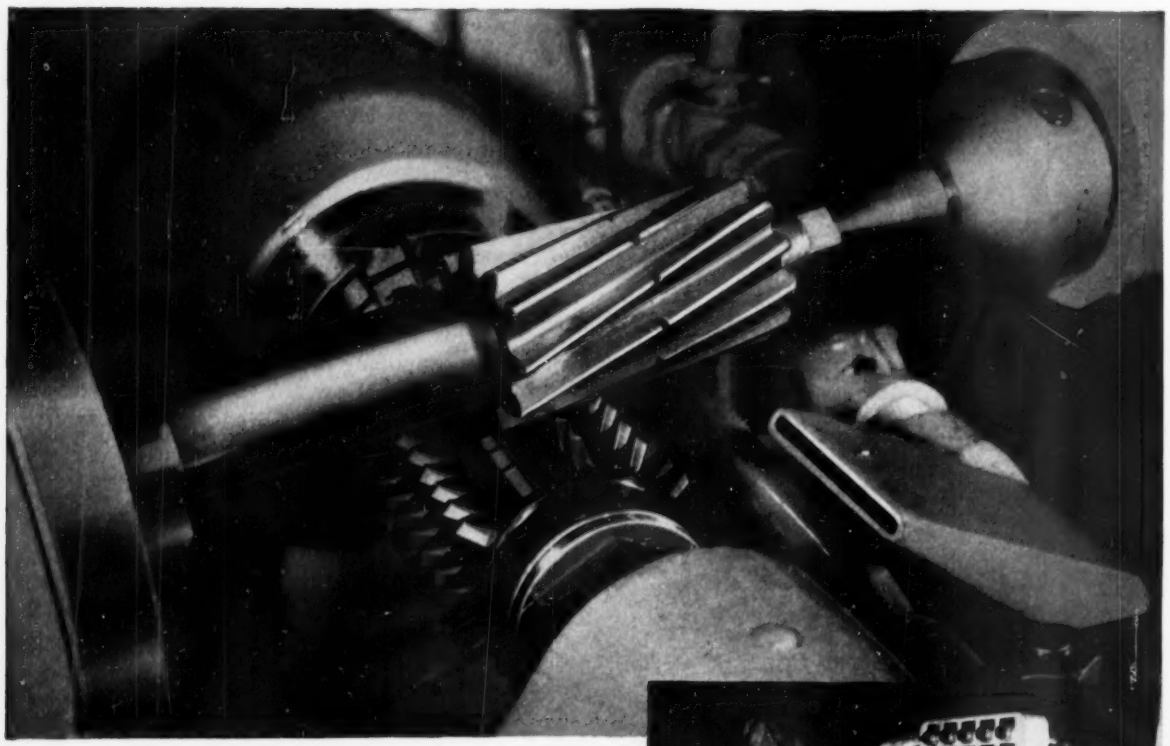
Ready now—your free copy of the new big COATED ABRASIVE SELECTOR catalog...containing detailed recommendations for both machine and hand sanding operations on tough and soft metals, glass, plastic, wood. Phone for it today.

RUNDUM

MARK

...the ONLY source for EVERY abrasive product you need

AUTOMATIC HOB SHIFTING



International Harvester Farmall Works were re-sharpening hobs on this pinion job after every 103 pieces. Hob shifts were made manually in 3 or 4 predetermined settings. Unavoidable minor variations in the amount and number of pieces per shift frequently produced some hob teeth which were worn more than others. A compensating amount of stock consequently was removed with each sharpening, reducing the potential number of sharpenings.

New Barber-Colman No. 16-16 Hobbing Machines, equipped with Automatic Hob Shifters, were installed. Now, after each cut, the hob is automatically shifted .0085" to a new cutting position. Production has jumped to 233 pinions per hob sharpening. All hob teeth show a uniform amount of wear, requiring only .010" stock removal per sharpening. Time required on sharpening machines has been reduced accordingly. Tool costs have been cut to one-third.

BUILDERS OF PRECISION GEAR

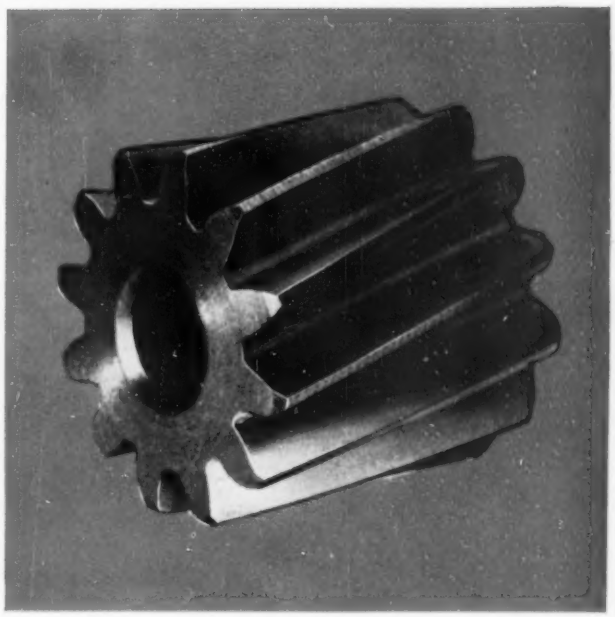
INCREASES HOB LIFE

INTERNATIONAL HARVESTER GAINS 130 MORE GEARS PER SHARPENING

Based on the number of hob sharpenings and the amount of stock removed per sharpening, these results indicate an increase in tool life of from 103 to 233 pieces per sharpening.

When you control uniformity and frequency of hob shifting, costs go down — tool life and production go up. The Barber-Colman Automatic Hob Shifter is equipped with change gears so that the hob can be shifted a pre-determined amount after each work load has been cut. Thus, the amount of shift can be selected so that the maximum number of pieces per hob will be produced. Safety interlocks prevent the shifter from operating during the cutting cycle, and torsion bar springs clamp the hob slide rigidly under maximum load.

See your Barber-Colman representative today, and ask him about Automatic Hob Shifting for your gear production. Write us for a copy of the new No. 16-16 Hobbing Machine Bulletin.



HOBS • CUTTERS • REAMERS
HOBBING MACHINES
HOB SHARPENING MACHINES

BARBER COLMAN®

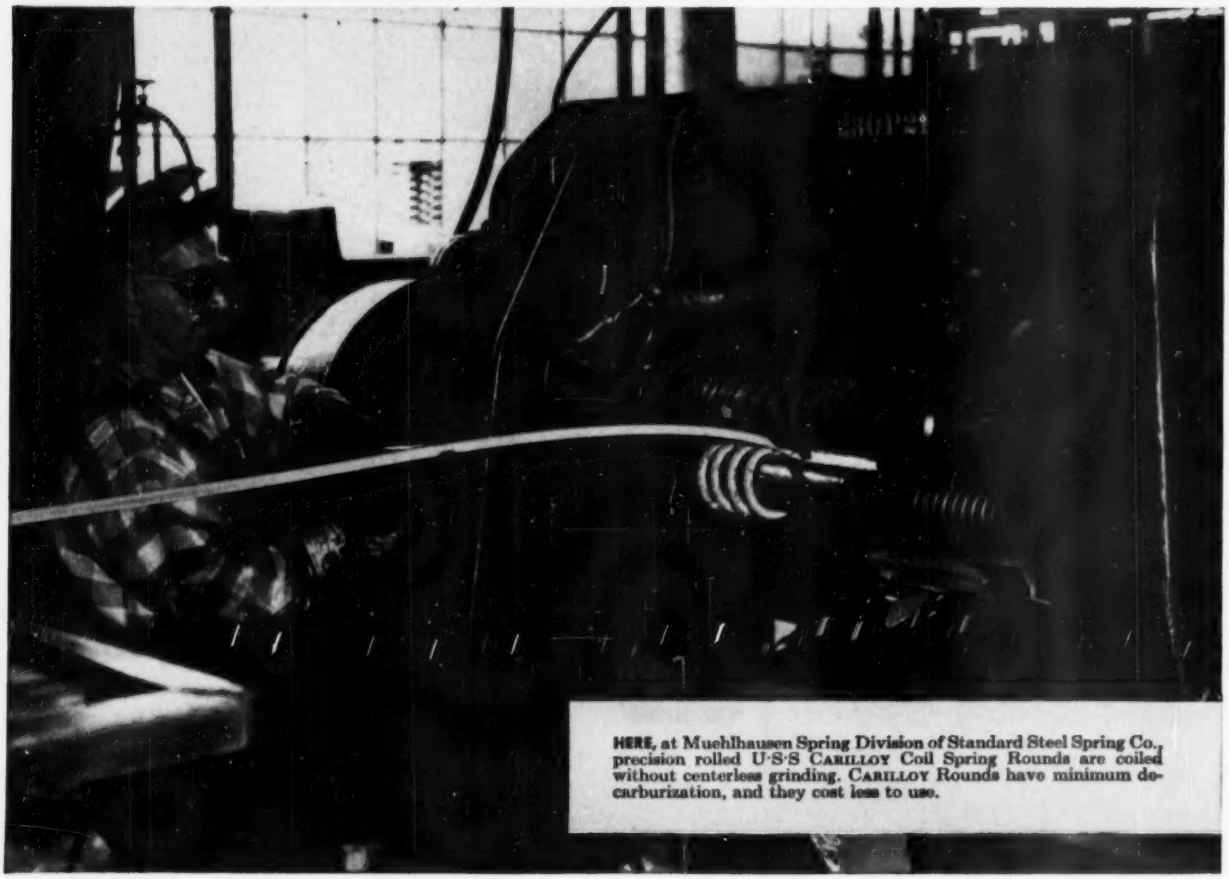
Barber-Colman Company

GENERAL OFFICES AND PLANT, 6112 ROCK STREET, ROCKFORD, ILLINOIS

HOBS AND MACHINES SINCE 1911

Half the new cars

U·S·S Carilloy



HERE, at Muehlhausen Spring Division of Standard Steel Spring Co., precision rolled U·S·S CARILLOY Coil Spring Rounds are coiled without centerless grinding. CARILLOY Rounds have minimum decarburization, and they cost less to use.

have coil springs made of *precision rolled rounds*...

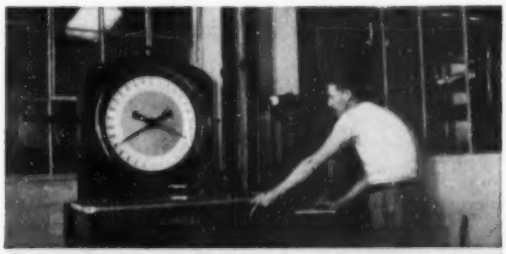
...twice as accurate as ordinary hot-rolled bars
...practically eliminate centerless grinding...cost less to make

IN the early days of the development of coil springs for front suspensions of automobiles, the only steel that was available was an ordinary hot-rolled bar from which as much as .035" of metal per side had to be removed by grinding to insure freedom from harmful seams, pits, and decarburization. This cost money, was wasteful and time consuming.

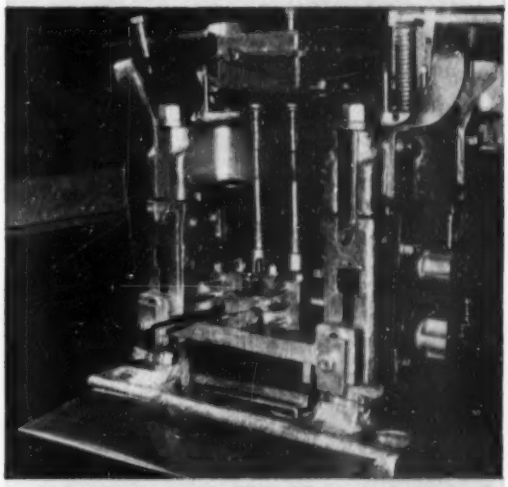
This seemed to be an expensive approach to a simple problem, so United States Steel equipped one of its mills to produce hot-rolled bars so free from harmful defects that most of the grinding expense could be eliminated. A method was devised for rolling a bar to half the standard tolerances, with half or less the amount of decarburization, which made it attractive to use the material "as furnished" or with a small amount of centerless grinding. We call this bar a Precision Rolled Coil Spring Round. It has performed excellently when used "as furnished" or with a small amount of grinding.

This exclusive development has paid off in two ways. It paid us because the CARILLOY Precision Rolled Coil Spring Round is now used in over half of the coil springs in new automobiles. But, most of all, it has paid off for the automobile manufacturer in that his costs are reduced with performance of the highest order. Today we are still hard at work developing new and better alloy steels for other new uses in automobiles; for example, in automatic transmissions, power steering units and other new and vital automobile parts.

Our experienced engineers and metallurgists will be glad to consult with *you* on any steel or fabrication problem. Just write to United States Steel, 525 William Penn Place, Pittsburgh 30, Pennsylvania.



COIL SPRINGS made of CARILLOY Precision Spring Rounds are uniform as proven in severe laboratory tests, as well as in actual service on America's best automobiles. They perform so well that half of all automobile coil springs are now made of CARILLOY steel.



AT THE GARY WORKS of United States Steel, this precision mill rolls CARILLOY Coil Spring Rounds with extreme accuracy. Tolerances are half of standard; .004" on the diameter, instead of the usual .008", and only .006" out of round, compared to .012" on ordinary rolled bars.

UNITED STATES STEEL CORPORATION, PITTSBURGH • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. • UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
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Carilloy USS Steels

ELECTRIC FURNACE OR OPEN HEARTH — COMPLETE PRODUCTION FACILITIES IN CHICAGO OR PITTSBURGH

S-1478

UNITED STATES STEEL

Here's another reason it pays to get a proposal from Fosdick

We hold spindle runout to

Less than .0002" runout at the end of a 12" proving bar! That's one of *many* rigorous tests every Fosdick Jig Borer must pass before it leaves our shop. These tests are your assurance, and ours, that you will get true precision... as good as *or better than* any Jig Borer will deliver—regardless of price! This machine is available with Automatic Positioning which enables you to locate holes to ± .0001", quickly and without need for highly-skilled operators.

For full description of the Fosdick Jig Borer, ask for Bulletin JB-A.

to give you

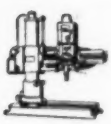
Precision Drill Head Boring Speeded by Automatic Positioning

Boring this four-piece 28-spindle drill head housing is a tough job in any man's shop. All bores have to be held to ± .0002". Further, all back boring on spindle locations must be within .0001" for alignment because any error multiplies 5 times or more at the drill point. For jobs like this, Fosdick's Proposal to the R. & B. Tool Co. of Saline, Mich., called for a 42-P Jig Borer with Automatic Positioning. In the first four weeks after R. & B. received the machine, they completed seven sets of the housing illustrated. Each included 139 holes charted, roughed and finish bored. Each, with a total of 528 machine positions, *required only 38 hours to complete.* Ten hours less, R. & B. estimates, than if they'd used a machine without automatic positioning!

.0002"

precision boring like this

Need Drilling Equipment? Get a Proposal from Fosdick!



Radial Drills

Jig Borers

Sensitive and Upright Drills

Sensitive Radial Drills

Automatic Positioning Machines

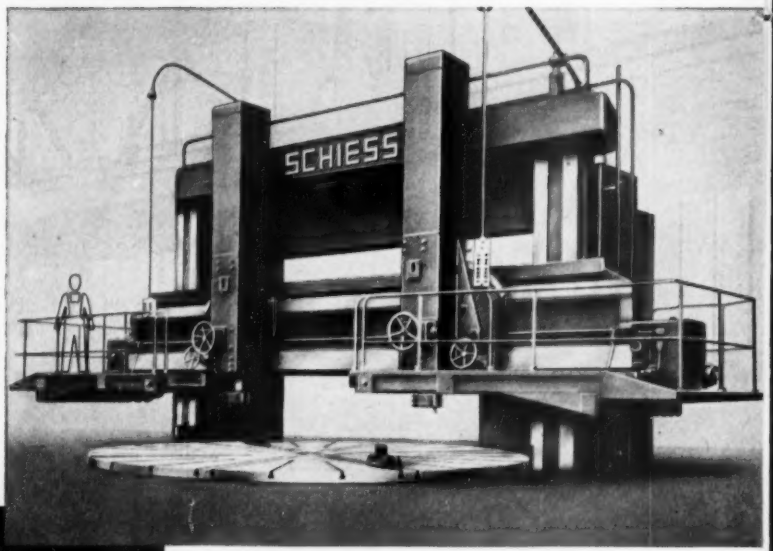
FOSDICK

THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO

See SCHIESS equipment on display at
AMERICAN SCHIESS SERVICE CENTER
38th Street & AVRR · Pittsburgh, Pa.

By combining basic Schiess elements, extra heavy machines that would normally be considered special tools, can be built to your work diameter and load requirements.

The equipment shown here is typical of unusually large boring mills of latest Schiess design which, like the smaller models, incorporate new operating features listed below.



Model 3K Vertical Boring Mill
with 15 ft. turning diameter

NEWLY DESIGNED

HUGE VERTICAL BORING & TURNING MILLS *like these* -

Built from basic Schiess designs to any diameter from 10 ft. to 84 ft.

Model 5K Vertical Boring Mill
with 22 ft. turning diameter

Fingertip Speed Control

Counterbalanced cross rail and side head

Octagon rams which can be swiveled, completely enclosed

Pendant Control

Automatic Lubrication

Vertical Boring Mills of this type can be equipped with inner and outer tables—and with 1 or 2 operator control panels.

Engineering Division

AMERICAN
SCHIESS
CORPORATION
38th Street and AVRR, Pittsburgh, Pennsylvania

Sole Distributor

KO KURT ORBAN COMPANY, INC.
205 East 42nd St., New York 17 • 1256 East 12th St., Cleveland 14
18627 James Couzens Highway, Detroit 35 • 1939 Santa Fe Ave., Los Angeles

Miller — HIGH PRESSURE

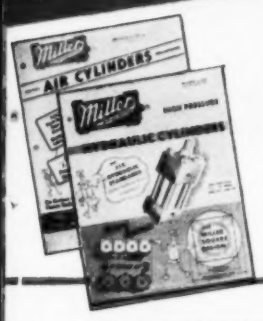
HYDRAULIC CYLINDERS

HARD CHROME PLATED PISTON RODS
Prevent Scratch-Damage, Nicks and Rust

SOLID STEEL HEADS, CAPS and MOUNTINGS
Eliminate Breakage

DIRT WIPER SEALS
Protect Rods, Seals, Bushings

Standard Leather Cup Seal Assembly Shown Is Interchangeable With Miller Standard Piston Ring Piston Assembly



WRITE FOR CYLINDER BULLETINS H-104 and A-105

Complete Miller cylinder line includes: air cylinders, 1½" to 20" bores, 200 PSI operation; low pressure hydraulic cylinders, 1½" to 6" bores for 500 PSI operation, 8" to 14" bores for 250 PSI; high pressure hydraulic cylinders, 1½" to 12" bores, 2000-3000 PSI operation. All mounting styles available.

MET J. I. C. HYDRAULIC STANDARDS years before their adoption in 1949.

SPACE-SAVING SQUARE DESIGN originated by Miller in 1945.

SALES AND SERVICE FROM COAST TO COAST

CLEVELAND • YOUNGSTOWN • DAYTON • PITTSBURGH • PHILADELPHIA • BOSTON • HARTFORD • NEW YORK CITY • BUFFALO • ST. PAUL • GRAND RAPIDS • DETROIT • FLINT • FORT WAYNE • SOUTH BEND • INDIANAPOLIS • MILWAUKEE • LOUISVILLE • KANSAS CITY • SEATTLE • LOS ANGELES • SAN FRANCISCO • BALTIMORE • DENVER • ST. LOUIS • MOLINE • CHICAGO • HOUSTON • TORONTO, CANADA and OTHER AREAS

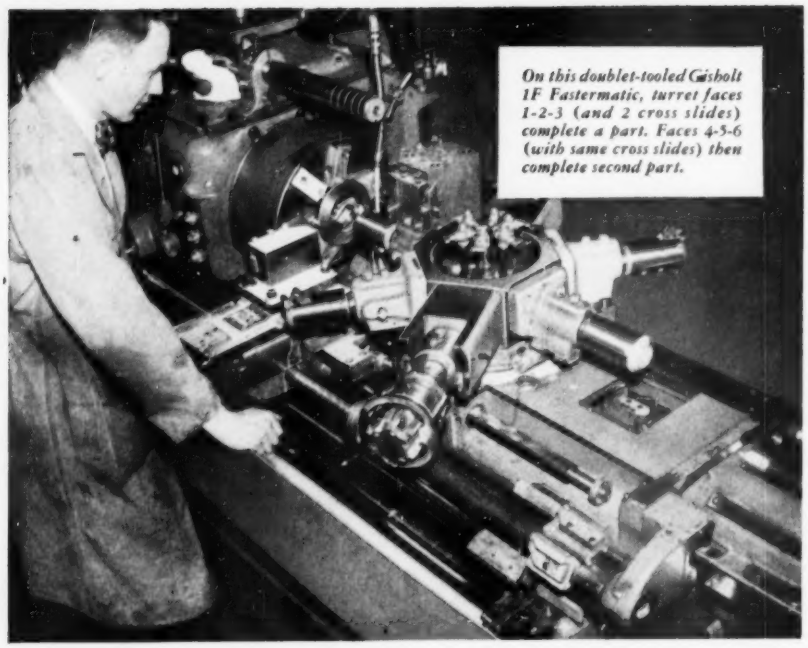
Miller

MILLER MOTOR COMPANY

2004 N. HAWTHORNE AVE., MELROSE PARK, ILL.

AIR & HYDRAULIC CYLINDERS • BOOSTERS • ACCUMULATORS
COUNTERBALANCE CYLINDERS

HOW DUPLICATE TOOLING... AND A FASTERMATIC...



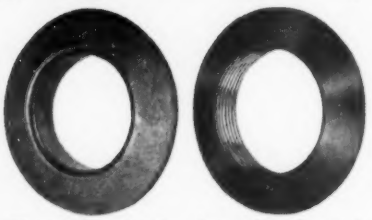
On this doublet-tooled Gisholt 1F Fastermatic, turret faces 1-2-3 (and 2 cross slides) complete a part. Faces 4-5-6 (with same cross slides) then complete second part.

doubled production!

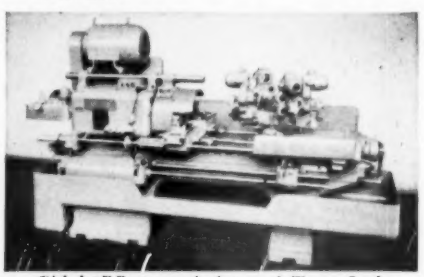
The time *and unit cost* for machining these cast iron pulley flanges were cut in half when the Fastermatic with double tooling took over the job.

Just three turret faces were needed to complete the machining and threading on each part. Therefore, tooling is repeated on the other three turret faces so that *two* parts are finished with each revolution of the turret. Production is doubled over the old method . . . time lag is cut to a minimum . . . there's twice the time between tool changes.

This smart setup illustrates one of the many ways Fastermatic Automatic Turret Lathes give you greater efficiency and lower costs on a broad range of jobs. And one operator can usually handle two or more machines. Ask for the facts.



Floor-to-floor time for these pulley flanges is down to 1.75 minutes. Duplicate tools and collapsing taps on the turret rough and finish the bore, chamfer and cut threads. Front and rear slides shave the angle and form the radius on the O.D.



Gisholt 1F Fastermatic Automatic Turret Lathe

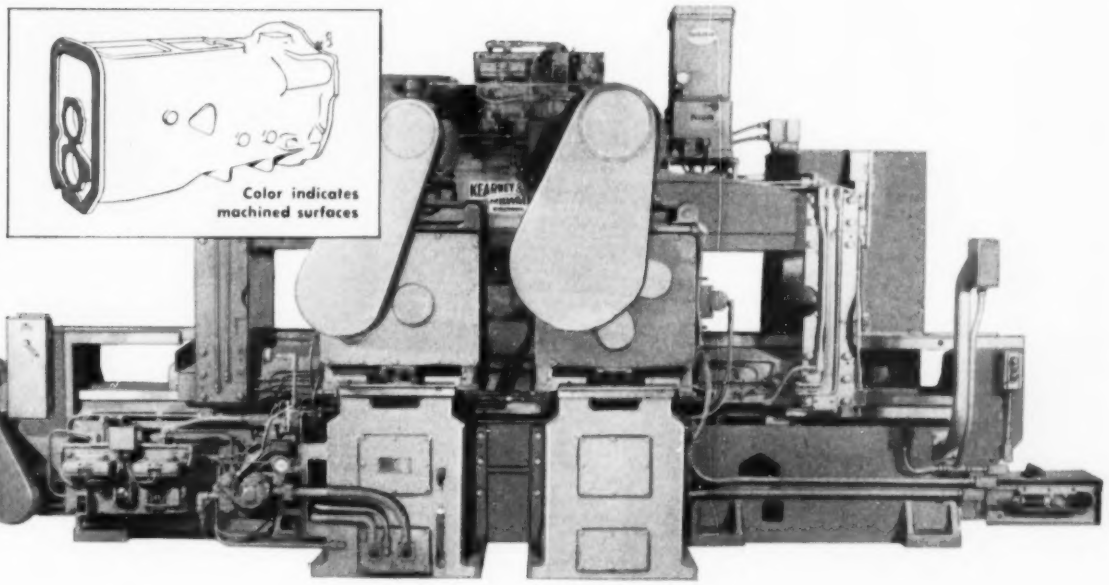
GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

THE GISHOLT ROUND TABLE *represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.*

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

What a saving...

Builders of Precision and Production Machine Tools since 1898



For the customer... it combined four milling operations in one machine!

THIS special 6-spindle transfer type milling machine was designed and built to keep a tractor manufacturer's production line rolling at high speed. The machine now mills opposing end faces of tractor transmission cases both flat and parallel . . . to close tolerances (.002) . . . in only 94 seconds.

FOUR HYDRAULICALLY RETRACTING HEADS... First two heads have two spindles each for roughing. Second two heads have one spindle each for finishing.

CLAMPING MECHANISM... Large hollow workpiece is secured at each machining station by a tunnel-type hydraulic equalizing clamping fixture. This eliminates the distortion usually encountered when clamping this type of workpiece.

If you have problems that require special machinery—contact your Kearney & Trecker representative.

Capacity . . . Experience . . . Performance

Upon completion of this $5,200,000 expansion of our Special Machinery Division, we offer you (1) unmatched facilities, (2) experience based upon more than 50 years in the design and production of special machinery, and (3) performance, best recommended by our outstanding record of successfully solving many hundreds of unusual machining problems.

For more details on this machine . . . ask for *Data Sheet No. 1002*. Free booklet, "Doorway to a proven method for solution of big and small metalworking problems" is also yours for the asking. *Write today to* SPECIAL MACHINERY DIVISION, KEARNEY & TRECKER CORP., 6784 West National Ave., Milwaukee 14, Wisconsin.

KEARNEY & TRECKER CORP. · *Special Machinery Division*
MILWAUKEE 14, WIS., U. S. A.

You get more parts per hour

PRODUCTION INCREASED 50% COSTS REDUCED 11.6%

MACHINE TEST REPORT

Stock Size	-5/8" Hexagon
Part Name	-Hose End Blank
Machine	-1-1/4 RAG Acme Gridley
Machine Operations	-Forming, drilling, reaming
End Tool Slide Com.	-1/2
End Tool Slide Feed	- .0065 for B-1113 - .0075 for MX

COMPARATIVE PRODUCTION

GRADE	RPM	SFM	PART TIME (SECONDS)	GROSS PARTS PER HOUR	PRODUCTION INCREASE (PERCENT)	TOOL LIFE INCREASE (PERCENT)
B-1113	1166	221	6	600	-	-
MX	1536	290	4	900	50	50

*ESTIMATE OF COMPARATIVE COSTS

	B-1113	MX
Net Production/Hr. at 70% Efficiency	420	630
Hours to make 10,000 parts	23.81	15.87
Direct Labor	$ 22.02	$ 14.68
Machine Overhead @ $2.275 per Mach./Hr.	$ 54.17	$ 36.10
Conversion Cost	$ 76.19	$ 50.78
Material Cost	$142.30	$142.30
Total Manufactured Cost of 10,000 parts	$218.49	$193.08
Saving	$ 25.41	or 11.6%

*Note-These cost figures have been calculated on the basis of current rates for Direct Labor and Machine Overhead and Machine Efficiency, used by a representative screw machine shop

PRODUCTION INCREASED 51.6% COSTS REDUCED 17.3%

MACHINE TEST REPORT

Stock Size	-1-1.8" Rd
Part Name	-Pulley Hub
Machine	-6 Spindle Conomatic, 1-1/4"
Machine Operations	-Rough form, finish form, drill, ream, counter-sink, spin, cut-off

COMPARATIVE PRODUCTION

GRADE	PART TIME (SECONDS)†	GROSS PARTS PER HOUR	PRODUCTION INCREASE (PERCENT)	TOOL LIFE INCREASE (PERCENT)
B-1113	22.9	157	-	-
MX	15.1	238	51.6	51.6

†Estimated

*ESTIMATE OF COMPARATIVE COSTS

	B-1113	MX
Net Production/Hr. at 70% Efficiency	110	157
Hours to make 10,000 parts	90.9	60.0
Direct Labor	$ 84.08	$ 55.50
Machine Overhead @ $2.275 per Mach. Hr.	$206.80	$136.50
Conversion Cost	$290.88	$192.00
Material Cost	$280.00	$280.00
Total Manufactured Cost of 10,000 parts	$570.88	$472.00
Saving	$ 98.88	or 17.3%

*Note-These cost figures have been calculated on the basis of current rates for Direct Labor and Machine Overhead and Machine Efficiency, used by a representative screw machine shop

PRODUCTION INCREASED 29% COSTS REDUCED 8.0%

MACHINE TEST REPORT

Stock Size	-3/4" Hexagon
Part Name	-Master Cylinder Outlet
Machine	-1-1/4 RAG Acme Gridley
Machine Operations	-Forming, drilling, threading, shaving, turning, cut-off
End Tool Slide Com.	-5/8
End Tool Slide Feed	- .0068 for B-1113 - .0073 for MX

COMPARATIVE PRODUCTION

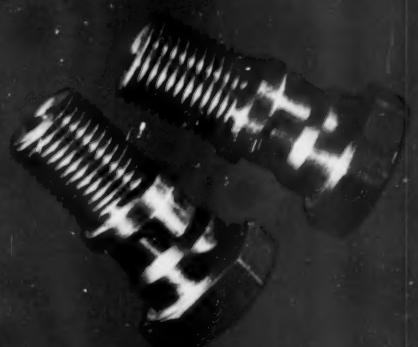
GRADE	RPM	SFM†	PART TIME (SECONDS)	GROSS PARTS PER HOUR	PRODUCTION INCREASE (PERCENT)	TOOL LIFE INCREASE (PERCENT)
B-1113	942	213	7-3.4	465	-	-
MX	1215	275	6	600	29	29

†Calculated from diameter across corners

*ESTIMATE OF COMPARATIVE COSTS

	B-1113	MX
Net Production/Hr. at 70% Efficiency	306	420
Hours to make 10,000 parts	32.68	23.81
Direct Labor	$ 28.36	$ 22.02
Machine Overhead @ $2.275 per Mach./Hr.	$ 69.80	$ 54.17
Conversion Cost	$ 98.18	$ 76.19
Material Cost	$175.50	$175.50
Total Manufactured Cost of 10,000 parts	$273.68	$251.69
Saving	$ 21.99	or 8.0%

*Note-These cost figures have been calculated on the basis of current rates for Direct Labor and Machine Overhead and Machine Efficiency, used by a representative screw machine shop.



at lower cost per part ...when you do the job with MX

*available in Bessemer or Open Hearth**

● You don't have to take our word for it. When we tell you that U·S·S Free-Machining MX will increase your production and that it will cut the cost of any part you now machine from ordinary screw stock, we have the FACTS to back us up . . . production and cost figures that speak for themselves.

In the three years that this high speed, freer-cutting bar stock has been on the market, hundreds of shops have put it to the test. Although the more than a billion parts made with MX have been of infinite variety and have been produced under dissimiliar conditions and on screw machine equipment of different types—the results obtained have been similiar.

Here is what has happened in shop after shop: Output per machine, per hour, per man, has been increased. Time between tool grindings has been extended. Parts finish has been better. Close dimensional accuracy has been easier to obtain. Rejections have been fewer.

And despite its better performance, MX costs no more than ordinary screw stock. Consequently, savings with MX have been invariably recorded. These savings have averaged between 10 and 15%, but also have run as high as 42%. Can you afford to give your competition this edge on you?

Give U·S·S Free-Machining MX a thorough trial. Produced in all the popular screw stock sizes, it is sold in cold-finished form by your regular supplier either as "MX" or under his own identifying trade name. In hot-rolled form MX is available direct through our nearest district sales office.

* To give screw machine operators a freer-cutting steel of the C-12XX type, MX is now also being produced in our Open Hearths. This steel, especially controlled to improve cold-drawing characteristics, assures users a fast-cutting bar stock not only of *excellent* surface quality but one that performs exceptionally well when finish-machined parts require crimping or other deforming operations.

USS

UNITED STATES STEEL CORPORATION, PITTSBURGH · AMERICAN STEEL & WIRE DIVISION, CLEVELAND

COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO · TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.

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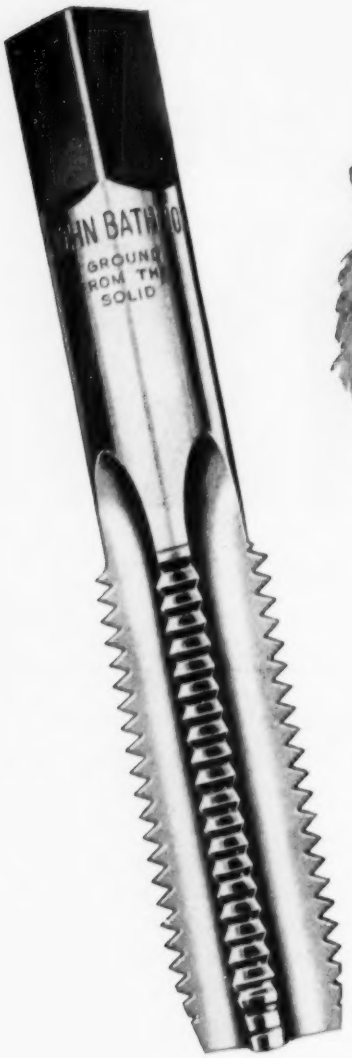
UNITED STATES STEEL



Sharp

Bath Taps have teeth with sharp cutting edges too — capable of "putting the bite" on the toughest materials.

What's behind this sharpness?

In the first place, Bath Taps are designed right, to have the proper thread form, lead and angle for efficient cutting.

Then, there's the careful selection of steel . . . hardening in the solid . . . accurate spacing in thread grinding . . . quality control of all mechanical operations . . . plastic skin protection in final shipment — all these details are reflected in the sharpness of the finished tap.

Such high standards of procedure, assure sharp, refined cutting edges on Bath Taps, all the way to the crests of the teeth — to produce more threaded holes per dollar—longer tap life between sharpenings.

Your nearest Bath representative will be glad to relieve your "threadaches" — he's a specialist in his field.

Bath engineers check every detail, to see that all Bath Taps are conditioned to do the best threading job for your requirements.

Insist on BATH TAPS for BETTER THREADS

JOHN BATH & CO., Inc.
28 Grafton St., Worcester, Mass.

PLUG AND RING THREAD GAGES • GROUND THREAD TAPS • INTERNAL MICROMETERS

CUT WITH CONFIDENCE

new

LeBLOND

OF CINCINNATI

32"

HEAVY DUTY ENGINE LATHE

WITH

HIGH-POWER

HEADSTOCK

NOW . . . cut with confidence at high horsepower!

New 32" Headstock Designed for Power

Heavy, short shafts minimize deflection.

Hardened and ground gears for all speeds except low back gear.

Finely-pitched wide gears for better tooth action and greater load-carrying ability.

Exceptionally low no-load-friction-horsepower (max. 3.4 hp @ 500 rpm) is proof of highly-efficient design.

Forced-feed lubrication throughout.

36 Spindle Speeds from 5 to 500 rpm

Direct-reading, color-keyed speed change levers.

New High-capacity 4-bearing Spindle

Radial loads @ 100 rpm:

Front Twin Timkens	73,800 lbs.
Center Double-Row Timken .	39,300 lbs.
Rear Ball Bearing	21,850 lbs.

60 hp Motor

EXCLUSIVE! Adjustable accelerations for starting, stopping, jogging

To bring heavy work pieces up to speed safely, torque applied for the first five seconds is adjustable. Any percentage of full torque can be selected for this interval. Similar adjustments can be made for stopping and jogging by means of three rheostatic controls to the electric clutch and electric brake.

Proven in Grueling Field Test

This headstock has been proven in the field on one of the toughest of all lathe jobs—roughing a heavy, out-of-round steel forging. Pulling two carriages, it has been hogging off over 75 cu. in. of metal per min.* The cuts consume a continuous *measured* 50 horsepower. Customer reports complete satisfaction.

*Two tools cutting at an average 1¼" depth at 200 ft. per min. equals 75.9 cu. in. per min.

LeBLOND OF CINCINNATI

4-DIRECTIONAL POWER RAPID TRAVERSE

Built as an integral part of the apron, LeBlond Rapid Traverse adds greatly to ease and speed of operation. A single lever controls movement of carriage in both directions and cross slide in and out.

ONE-PIECE APRON, HARDENED RACK

A rugged one-piece, double-wall casting houses the sturdy shafts and gears and the positive-jaw feed clutch. A single lever controls both cross and length feed. All bearings, cross slide and carriage ways are *lubricated automatically*. The rack is flame hardened.

TOTALLY-ENCLOSED QUICK CHANGE BOX

Sealed in an oil-tight casting and lubricated automatically, this quick-change box requires no operator attention. Steel gears are used throughout and sliding gears are mounted on splined shafts. Forty-eight feeds and threads may be quickly set from the direct-reading plate.

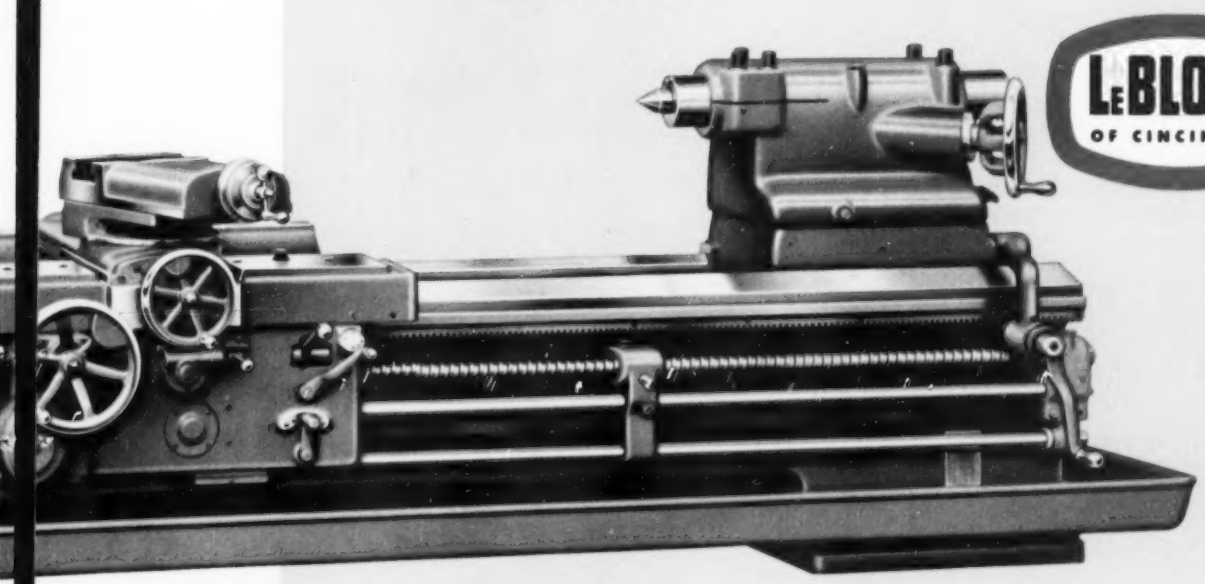
HARDENED AND GROUND STEEL BED WAYS

Of compensating vee-way design, these hardened ways (62-66 Rockwell C, 600 Brinell) are replaceable in the event of accidental damage.

THRUST-LOCK TAILSTOCK

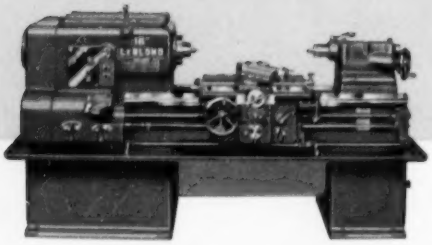
This exclusive LeBlond design, incorporating a worm and rack construction, puts the handwheel at a convenient angle to the operator, provides positive safety lock against thrust and exceptionally long travel. Full-length support when spindle is extended.

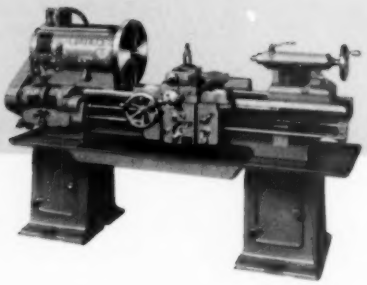
Write today for Bulletin HD-164.



LeBLOND
OF CINCINNATI

SELECT YOUR LATHES FROM LEBLOND'S 76 MODELS





HEAVY-DUTY ENGINE AND TOOLROOM

Free-running spur-gear headstock, 3 and 4-bearing spindles, totally-enclosed quick change box, one-piece apron, thrust-lock tailstock, hardened and ground replaceable steel ways, 4 and 6-way power rapid traverse on larger models. Swings—12″, 14″, 16″, 20″, 25″, 32″, 40″ and 50″.

REGAL

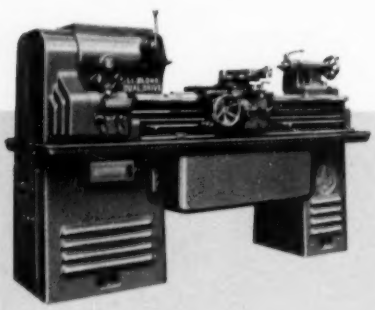
Light-duty lathes with heavy-duty features—ideal for production, job shop work and training. Geared headstock, quick change feed box, separate leadscrew and feed rod, taper key drive spindle nose, one-piece apron. Swings—13″, 15″, 17″, 19″, 21″, 24″, and 13″ bench model. 17″, 19″, 21″, 24″ Gap and 17″/28″ Sliding Bed Gap.

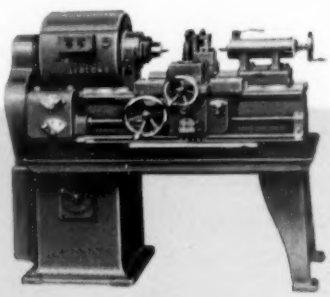
DUAL-DRIVE

15″ swing; twelve speeds, 28 to 1800 rpm; hardened and ground replaceable steel ways; single lever speed control, 96 feeds from .0004″ to .106″; forty-eight threads from 4 to 224; automatic lubrication through headstock and feed box, 3 hp.

RAPID PRODUCTION

Designed *especially* for low-cost high-production turning. *Not* a stripped-down engine lathe. Choice of headstocks gives you speeds within the range *you* choose. Swings—13″, 17″, and 20″.





Crankshaft Lathes—for roughing and finishing all elements of any crank—automatic for mass production. *9 out of 10 crankshaft lathes built today are LeBlond's.*

"Hydra-trace" Duplicating Attachment—for smooth hydraulic tracing of a great variety of contours. Fits any LeBlond built since 1935—except Regals.

Plain and Sliding Bed Gap Lathes—12″, 14″, 16″, 20″, 25″, and 32″; 16″/38″, 25″/50″, 32″/60″.

Hollow Spindle Lathes—16″, 20″, 27″, and 30″.

Contour Facing Lathe—For automatic contour facing of large-diameter work.

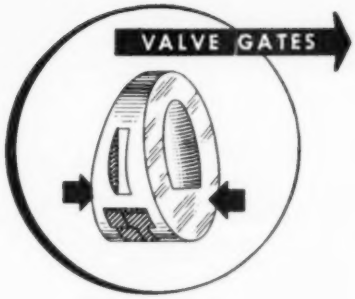
Complete line of lathe attachments.

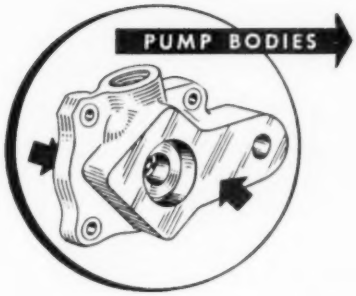
WRITE TODAY FOR CATALOG 53.

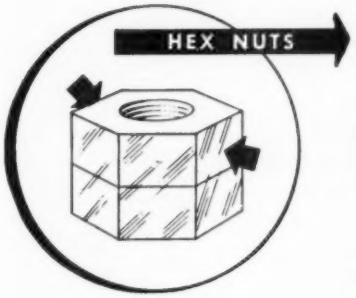
THE R. K. LEBLOND MACHINE TOOL CO., CINCINNATI 8, OHIO

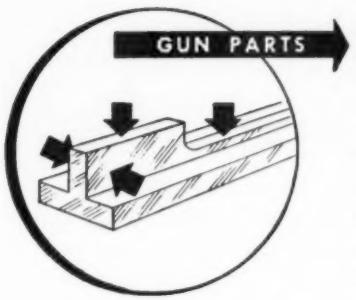
LeBLOND
OF CINCINNATI

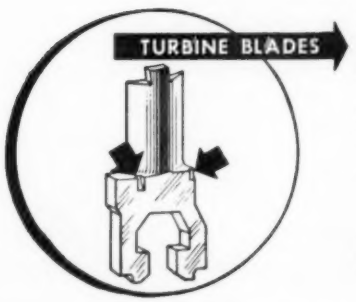
WORLD'S LARGEST BUILDER OF A COMPLETE LINE OF LATHES • FOR MORE THAN 64 YEARS

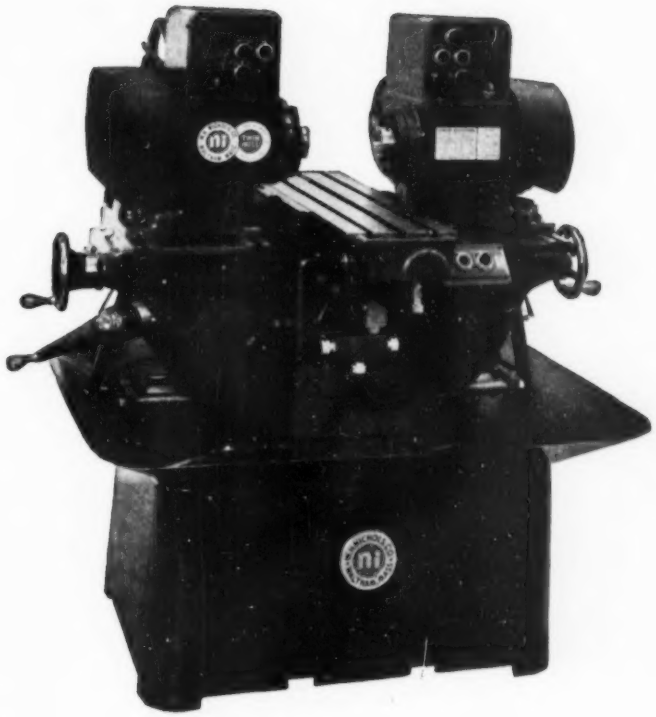












on the NEW *Nichols* TWIN MILL

The TWIN MILL cuts milling costs in half on many jobs. It handles **TWO** milling operations at a time, yet requires but **ONE** fixture and **ONE** operator. Designed for the class of work usually assigned to Hand Millers or light Automatic Production Millers, the Twin Mill's speed, accuracy, and exceptional flexibility add up to increased output at lower cost. **New** Spindle Retraction automatically withdraws cutters at the end of each cutting stroke. **New** Spindle Brakes act instantly after cycle is completed. The Two Milling Heads are independent units with individual motor drives, quickly adjusted UP or DOWN, IN or OUT, or OFF-SET longitudinally. Machine handles short run or long run work economically. Automatic table cycle and entire machine push-button controlled. Write for details.

CONDENSED SPECIFICATIONS

Table, working surface	8⅝"x 30"
Table, travel—cutting stroke	11¾"
Motors	(two) 1 HP
Maximum height center of spindle above table	11¾"
Maximum offset of spindles (horizontal)	8½"
Maximum distance between spindle noses (across table)	16"
Floor space required	64"x56"
Spindle Speeds (15)	from 55 to 2050 R.P.M.

Manufactured by W. H. Nichols Co., 48-U Woerd Ave., Waltham 54, Mass.

Have you seen the new Nichols' movie, "The Miller That Uses Its Head"? It's available for showing in your plant.

Also available are NICHOLS Hand Millers, NICHOLS two-spindle millers with identical or opposed spindles, and with or without pneumatic feed.

Please address inquiries to

NICHOLS-MORRIS CORPORATION 76-F MAMARONECK AVE. WHITE PLAINS, N. Y.

Dealers in Principal Cities

This is another of the "HUNDREDS OF JOBS" which can be done on a MARVEL Band Saw!

MARVEL BAND SAW saved these two 4400 lb. castings

Two sand cores washed out when these giant 4400 pound steel connecting rods were cast, resulting in solid eye ends without gaps. Then came the $64 question—how to machine out the 1½" slots in the longitudinal center of the eyes which were 22" high and had a wall thickness of 6½".

The Ernest J. Nelson Iron Works of San Francisco, did this "impossible" job easily, quickly and economically, without special tooling, on a standard Model #8M/2 MARVEL Band Saw. Two cuts were made in each rod in two hours per cut with tool cost of $3.06 per rod. The tool was a MARVEL B9-10 Band Saw Blade.

Every tool room, machine shop and maintenance department needs a MARVEL Series 8 Universal Band Saw—not only for innumerable everyday jobs but for the occasional "trick" operations, where its utmost versatility will save many headaches and dollars.

WRITE FOR CATALOG

These exclusive Marvel Features made this job easy.

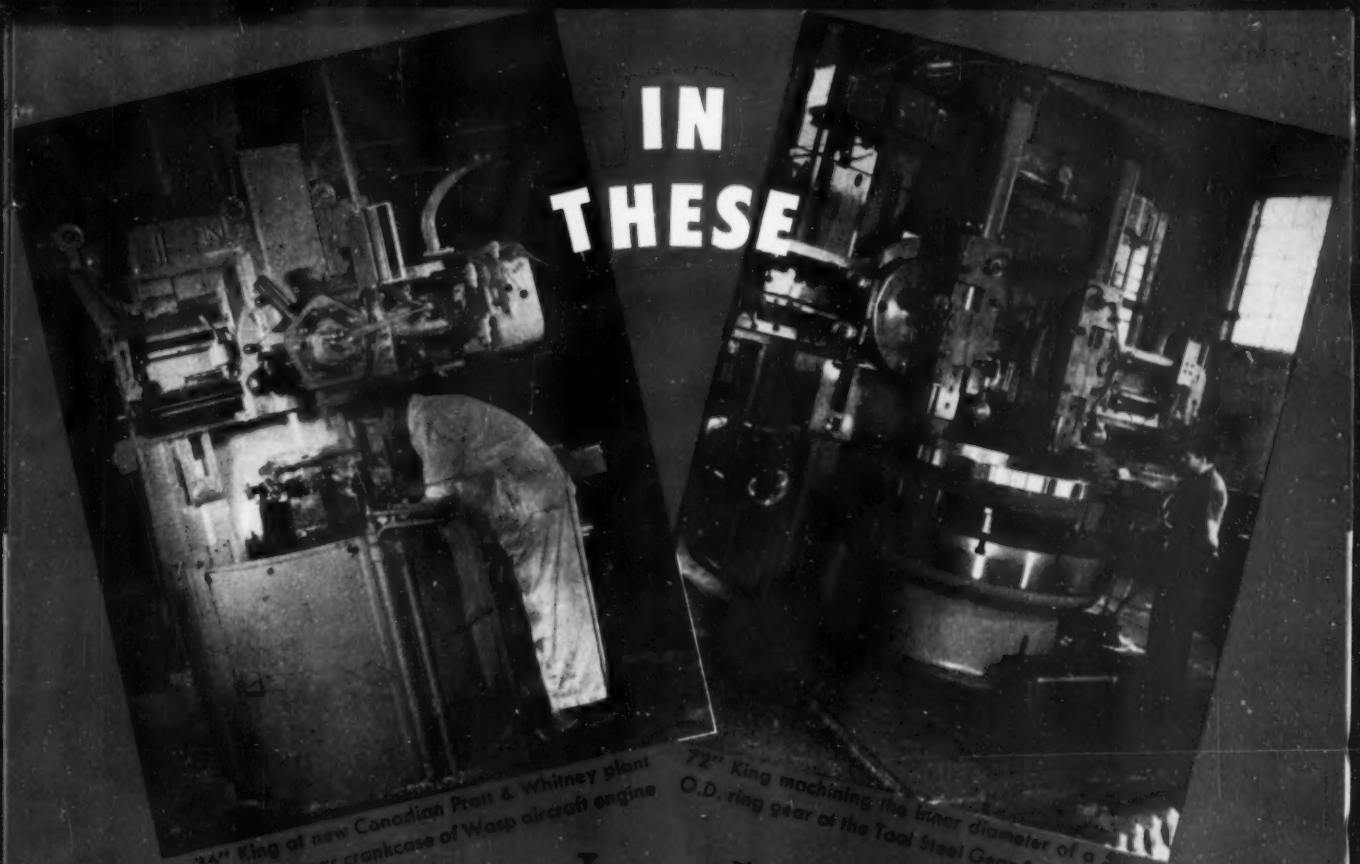
1. **Large, T-slotted work table.**
2. **Blade feeds into work vertically; work always stationary.**
3. **Power-Pressure feed.**
4. **Automatic Blade tension.**
5. **Built-in coolant system.**
6. **Large capacity.**

Metal Cutting MARVEL SAWS
Better Machines—Better Blades

ARMSTRONG-BLUM MFG. CO.

5700 BLOOMINGDALE AVENUE **CHICAGO 39, ILLINOIS**

SEND OUT CATALOG In



36" King at new Canadian Pratt & Whitney plant machining rear crankcase of Wasp aircraft engine

72" King machining the inner diameter of a 5' O.D. ring gear of the Tool Steel Gear & Pinion Co.

MACHINE TOOLS · VALVES · TIRE MOLD · RAILROAD · AUTOMOTIVE · ELECTRICAL · ORDNANCE · IRON & STEEL · MINING · SHIP BUILDING

AND IN *EVERY* MAJOR AMERICAN INDUSTRY

OIL WELL EQUIPMENT · INDUSTRIAL EQUIPMENT · CONSTRUCTION MACHINERY · EARTH-MOVING EQUIPMENT

IT'S KING FOR *Accuracy, Power, Speed, Versatility*

KING Vertical Boring and Turning Machines are designed in every detail to give you performance that sets new standards in production cost-cutting. Incorporating traditional KING qualities of massive proportions, heavy weight, extreme rigidity and accuracy, these versatile machine tools can take on heaviest cuts at highest speeds within the capacity of modern cutting tools.

Production time is further speeded up by the labor-saving ease of operation made possible by KING centralized controls. All controls are conveniently located at front of the machine. On-the-spot precision adjustments are made quickly from the operator's normal working position.

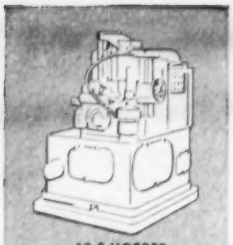
Throughout industry, KING Vertical Boring and Turning Machines have proved their ability to cut costs and improve quality on the complete range of boring, facing, and turning work. Made in 10 sizes, from 30" to 144"—the widest range in the field. Investigate KING advantages now!

American Steel Foundries
KING MACHINE TOOL DIVISION

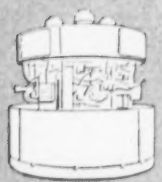
KING

VERTICAL BORING & TURNING MACHINES

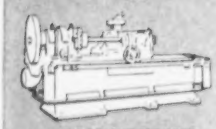
1130 Tennessee Avenue
Cincinnati 29, Ohio



12-S HOBBER

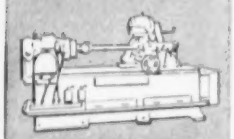


7-A ROTARY HOBBERS

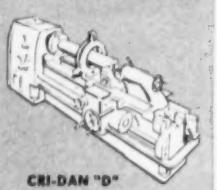


SH SPLINE HOBBER

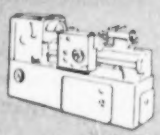
MODEL 40 THREAD MILLER



HT THREAD MILLER

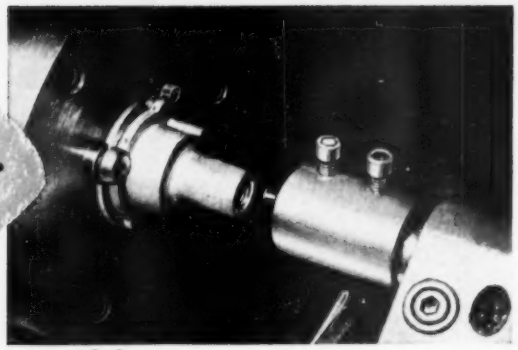


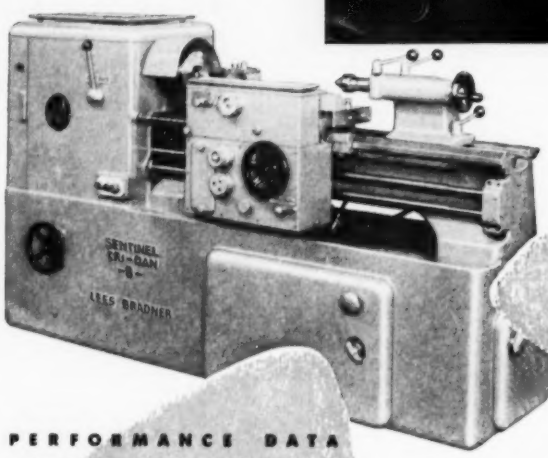
CRI-DAN "D"



CRI-DAN "B"

SMALL PART...





BIG SAVINGS

PERFORMANCE DATA

Material	Die cast aluminum
Thread produced	⅜"-18 UNF 2B internal
Thread length	⅜" full thread
Depth C'bore for thrd.	7/16"
RPM	2000
Number passes req'd	8
Type tool	Carbide
Approx. pcs per grind	7500
Cutting time	8 seconds
Floor to floor time	15 seconds

with the CRI-DAN "B"

SINGLE POINT THREADING MACHINE

● Again, the Cri-Dan Threading Machine proves its amazing efficiency.

This small aluminum casting, formerly threaded on a tapping machine was set up on the Cri-Dan "B". The finished casting required a ⅜"-18 class 2B internal thread cut to within 1/16" of the shoulder. When the Cri-Dan " took over," the scrap loss due to concentricity was completely eliminated, thread depth was consistently maintained and overall production increased.

This case history of a leading manufacturing company* proves again that your Lees-Bradner representative can help increase your savings on threading operations. Contact him today.

*name on request

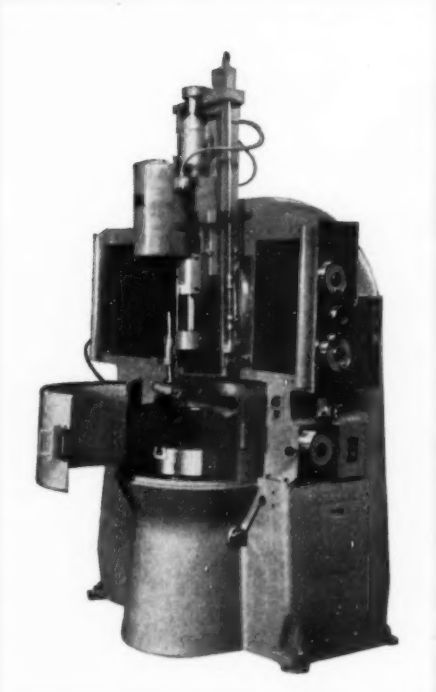
the LEES-BRADNER® Company

CLEVELAND 11, OHIO, U.S.A.

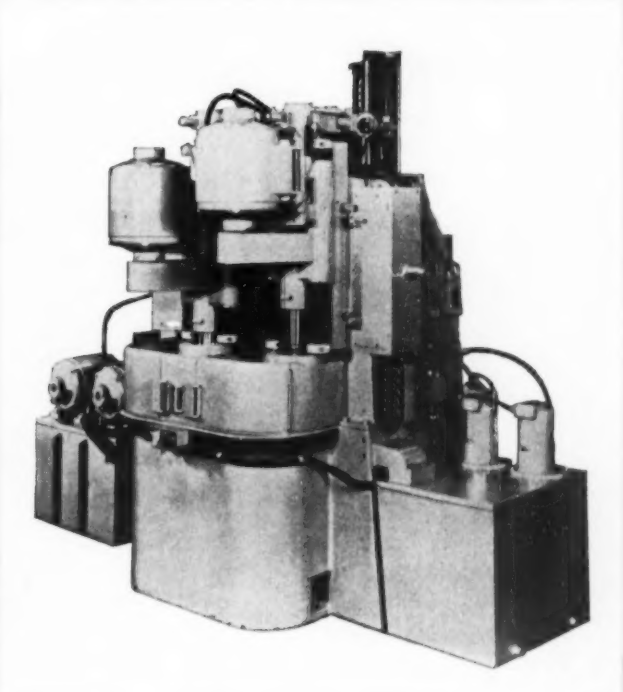
SPRINGFIELD

GRINDERS

the modern approach to chucking grinder operations



Vertical grinding of O.D., I.D., faces, tapers, shoulders, steps or combinations with one set-up. Holds extremely close tolerances on precision production. All slideways above grinding wheel. No gravitational pull; work sets solidly on vertical spindle. Greater work visibility; easier loading; more convenient control.



Dual spindle Vertical Grinder has individual operated spindles with individual controls and individual automatic cycles. Can be arranged for duplicate production or to handle consecutive operations on a single piece part. Higher production with less floor space and lower capital investment.

THE SPRINGFIELD MACHINE TOOL COMPANY

SPRINGFIELD, OHIO, U. S. A.

GENERAL DISTRIBUTORS: BRYANT MACHINERY & ENGINEERING COMPANY, 640 W. WASHINGTON BLVD., CHICAGO 6

EXCLUSIVE REPRESENTATIVES IN ALL PRINCIPAL CITIES

"Ultra-Speed" hobber at Pratt & Whitney Aircraft hobs aircraft gears.
GEAR CUTTING
GEAR FINISHING
Complete Equipment For Gear Production
GEAR LAPPING
GEAR CHECKING
Michigan
"ULTRA-SPEED"® 1458-A HOBBER

HIGH PRODUCTION HOBBER *Cuts* P & W AIRCRAFT GEARS

Using a machine well known for its high production capacity to handle moderate length runs of aircraft gears is paying off at Pratt & Whitney Aircraft. The secret of this success is found in the rapid change-over time from one gear to another.

Efficient utilization of any high-output machine for short-run work depends on rapid changeover. It only takes 45 minutes to ready Michigan Tool Company's "Ultra-Speed" hobber for a different job. This time includes changing the integral tooling, hobs, change gears, etc.

Although the production rate of the hobber at Pratt & Whitney Aircraft is classified, it doesn't take too long to handle most runs of aircraft gears. Flexibility and high output make the "Ultra-Speed" hobber doubly valuable to any plant with a variety of gear production runs.

Send for Bulletin No. 1458-A, which describes the Michigan "Ultra-Speed" hobber in detail.

GEAR PRODUCTION HEADQUARTERS

MICHIGAN TOOL COMPANY

from blank to finished gear

7171 E. McNICHOLS RD. • DETROIT 12, MICHIGAN, U. S. A.

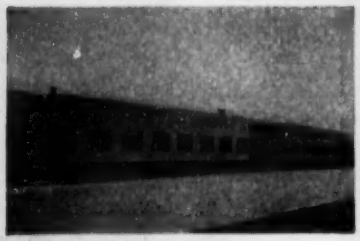
SAN FRANCISCO

ST. LOUIS

SEATTLE

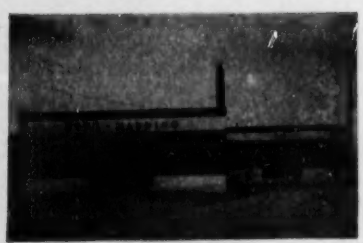
PHILADELPHIA

NEW YORK



LOS ANGELES

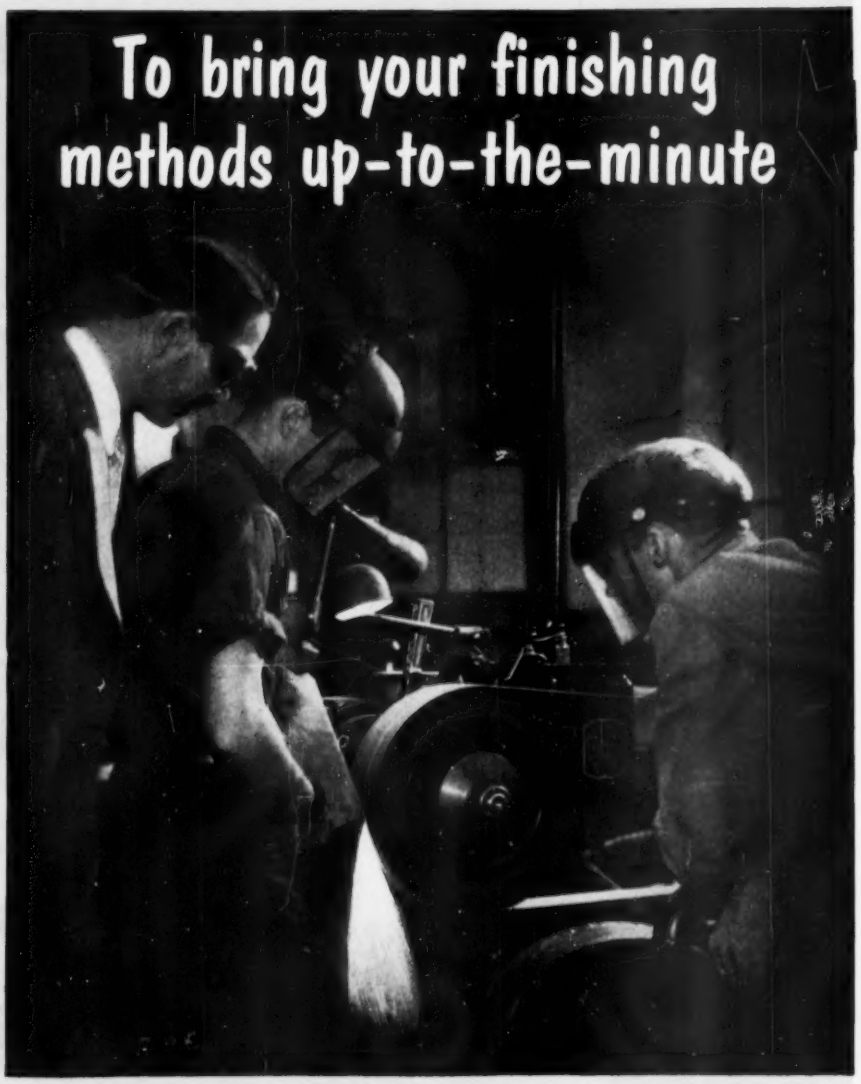
INDIANAPOLIS



HIGH POINT

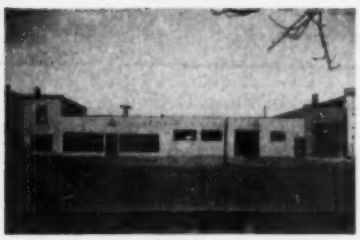
GRAND RAPIDS

DETROIT



ATLANTA

BOSTON



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G-5

use your nearest Behr-Manning abrasive belt "production laboratory"

On typical pieces of your own production, try out the latest developments in abrasive belt applications. Utilize the specialized skill of BEHR-MANNING Engineers, plus the constantly improving results of BEHR-MANNING research. All this is available to you at no cost, in your nearest BEHR-MANNING Methods and Equipment Demonstration Room — actually a proving ground for production.

Sixteen strategically located branches now have these BEHR-MANNING "production laboratories," all completely equipped, operating with the sole aim of insuring you the greatest possible economies in belt application. Considering the recent rapid advances in this field, a visit to your local Demonstration Room may very well be the basis for decidedly worthwhile savings, better finishes, or both. Make an appointment by phone, or write us direct.

For interesting data on new belt methods, write for the booklet, "How Polisher Pete Put Economy in Polishing." Address Behr-Manning Corp., Troy, N. Y., Dept. AM-12.

In Canada: Behr-Manning (Canada) Ltd., Brantford.
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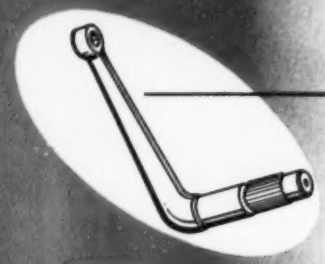
BEHR-MANNING
CORPORATION
division of NORTON Company

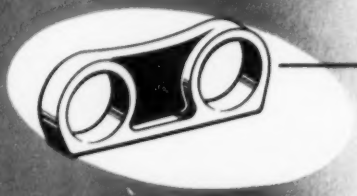
▲ COATED ABRASIVES
▲ SHARPENING STONES
▲ PRESSURE-SENSITIVE TAPES

For the newest in coated abrasives...watch Behr-Manning!



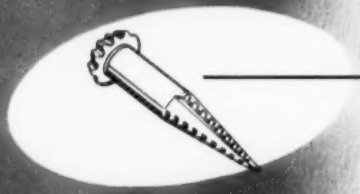
DETROIT BROACH TOOLS STEERING ARMS

Production costs took a sharp turn downward when Detroit Broach tooling started producing the spline on tractor steering arms. Teeth are produced in one machine cycle with simple tooling on an economical punch press.



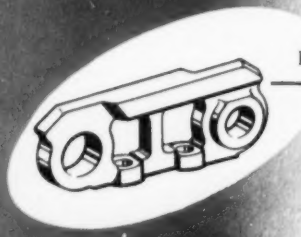
DETROIT BROACH TOOLS END PLATES

Accuracy climbed and costs slipped when Detroit Broach tooling finished the holes in track end plates. Two holes are machined at once, with accuracy well within specified production tolerances.



DETROIT BROACH TOOLS COTTON PICKER SPINDLES

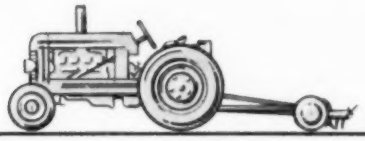
Consistent top notch quality is easy pickin' since Detroit Broach tooling started putting the "bite" on these spindles. Tooth spacing, size, and shape on each flute are consistently identical with important production economies, too.



DETROIT BROACH TOOLS SIDE BARS

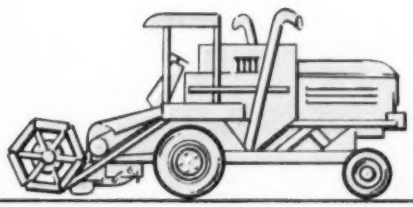
Broaching the holes in track side bars is another operation with better accuracy and lower costs since Detroit Broach tooling took over. Size, spacing, concentricity and squareness are within tolerance limits while achieving steady, high-output production quotas.

This is a view of the new, ultra-modern Detroit Broach plant and offices located in Rochester, Michigan—just outside Detroit. Designed by Sture Frolen, eminent Swedish architect, it embodies many important advancements that contribute to employee morale and manufacturing efficiency. Another example of the unusual facilities of Detroit Broach Company.



Broaching Pioneers

IN THE FARM EQUIPMENT INDUSTRY



Dependable, work-saving agricultural equipment, at a price practical for the majority of farmers, has accounted for the rapid growth of mechanized farming in the past twenty years.

And one of the important means which equipment manufacturers use to cultivate more production at lower cost is broach tooling from Detroit Broach. A few typical parts which Detroit Broach has tooled for agriculture are shown at the left.

in YOUR industry, too,

there are countless examples of Detroit Broach tooling that is helping to lower the boom on production costs. At the same time, it is tooling which consistently reaps a bumper crop of benefits in terms of closer tolerances with repetitive accuracy, good surface finishes, and low tool maintenance costs.

Chances are that Detroit Broach tooling can do the same for you! You can find out by simply contacting your local Detroit Broach representative or by dropping a line to the home office. There's no better time than right now to do it.

Detroit Broach COMPANY

ROCHESTER, MICHIGAN

OFFICES IN PRINCIPAL CITIES THROUGHOUT THE WORLD

Another typical

Morris

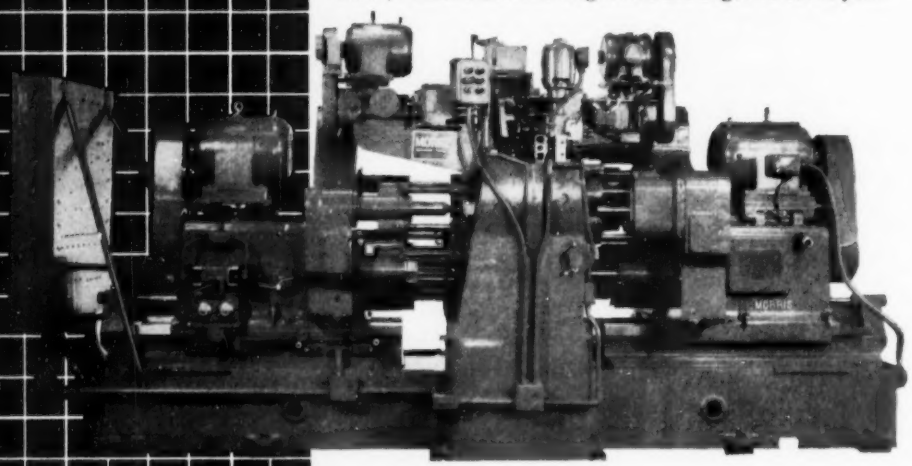
MOR-SPEED
production machine
performance record

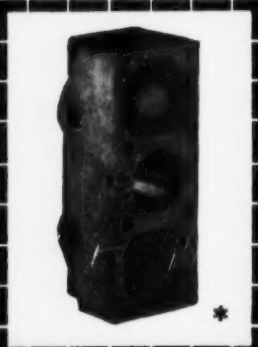
35% SAVINGS IN LABOR
REPLACES 6 OLDER MACHINES
PAYS FOR ITSELF IN 9 MONTHS

The two way horizontal, eight station, automatic indexing machine illustrated drills, reams, countersinks, forms radius and taps 187 refrigeration unit cylinders per hour.

This unit is equipped with nineteen drilling spindles, fourteen countersinking spindles, four counterboring spindles, one reaming spindle and eleven tapping spindles. Twenty spindles are in the left hand head and eighteen in right hand head.

If your work requires numerous operations on a mass production basis, consult us. Our engineers are eager to serve you.





OPERATIONS PERFORMED:

Drill, countersink and tap 8,—¼"—28 tap holes

Drill, ream and chamfer both ends of 1⅛" hole

Counterbore for ⅝" dia. segment

Drill, countersink and tap 1—$\frac{8}{32}$ tap hole

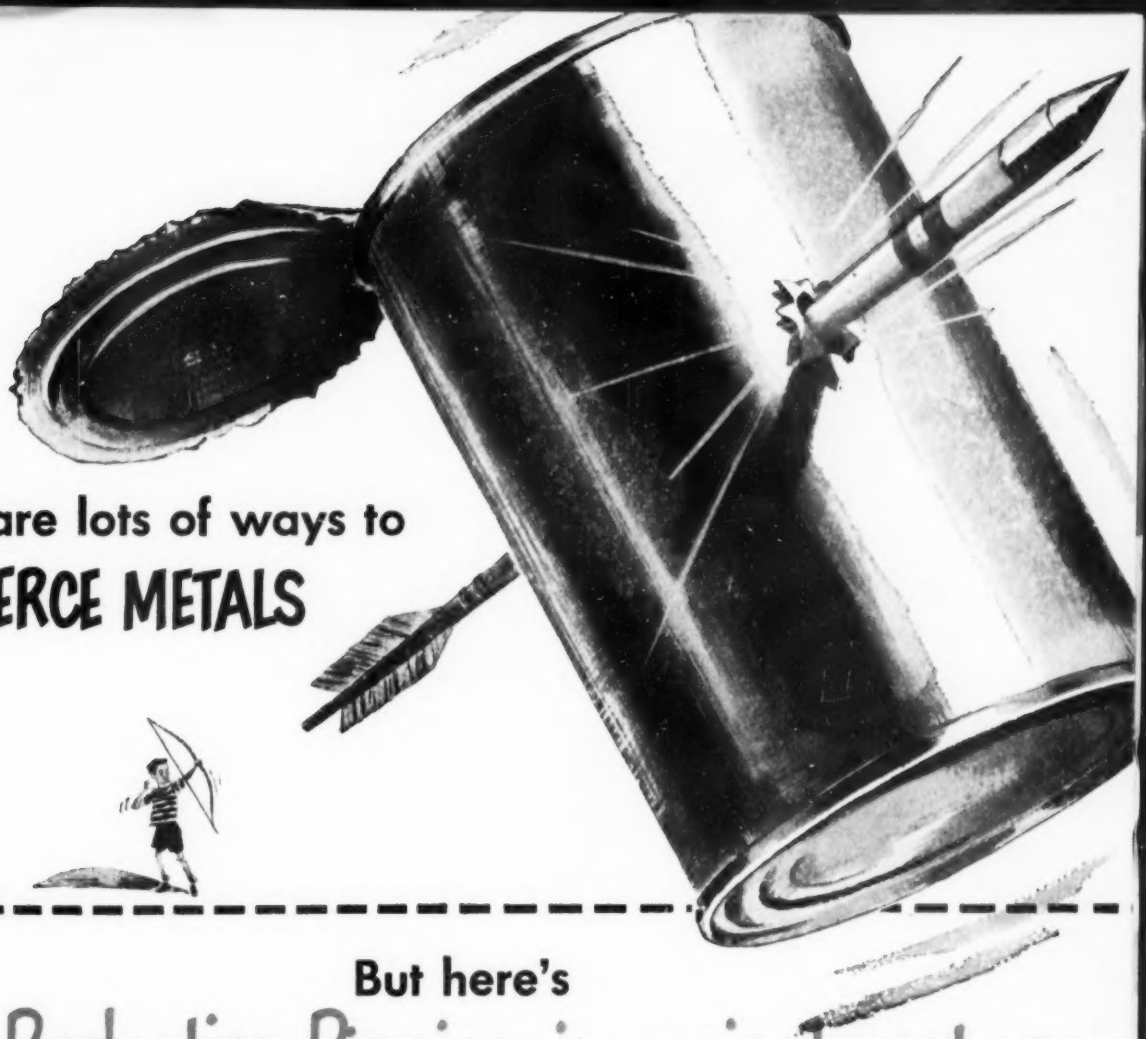
Drill, countersink and tap 2—⅜—24 tap holes

*Refrigeration Unit Cylinder

Builders of MOR-SPEED Tools

Morris **THE MORRIS MACHINE TOOL CO.**
933 Harriet Street, Cincinnati 3, Ohio

"A Better Product at Less Cost with PRECISION PLUS PRODUCTION."

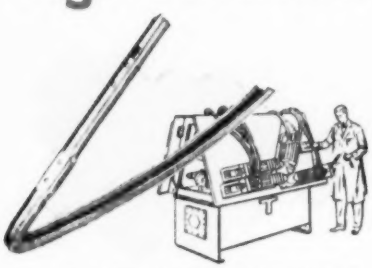


There are lots of ways to

PIERCE METALS

But here's

High Production Piercing in a single set-up

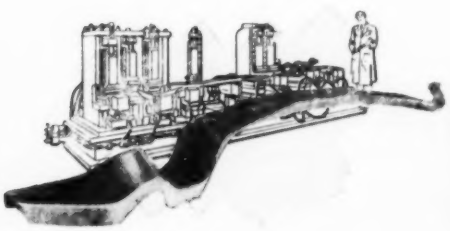


Seven irregular holes and two trimming operations complete this car door inner window frame in one setup. Model changes can be made at low cost.

DANLY HYDRAULIC METALWORKING EQUIPMENT

Now you can pierce multiple holes of practically any type—round, oblong or irregular—to very close tolerances in a single setup. Capacity of Danly Metalworking Equipment can be as high as 225 tons per hole with break-through shock practically eliminated. Each station hydraulically strips its punch, greatly simplifying fixturing. Custom-built for your piece part, Danly Hydraulic Metalworking Equipment enables you to pierce more holes faster and more accurately—in one operation.
Write for the special bulletin shown at right today.

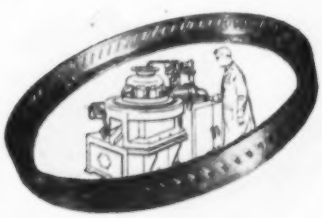
DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue, Chicago 50, Illinois



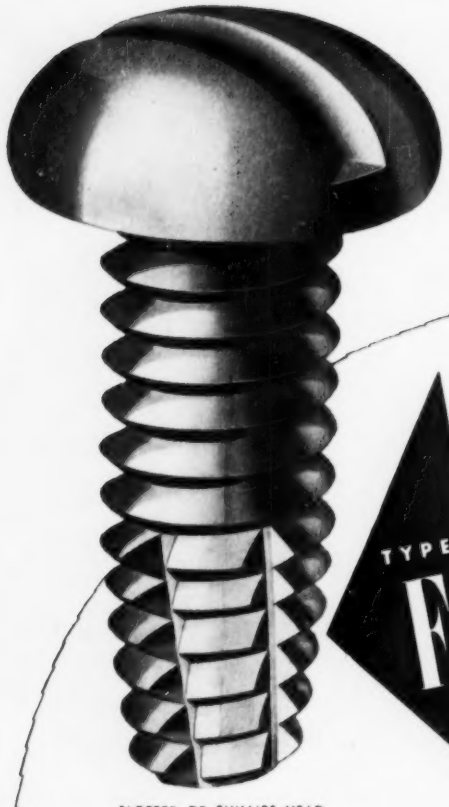
More than 40 holes in this automotive frame member are pierced simultaneously on a Danly machine built expressly for this purpose.

DANLY

HYDRAULIC METALWORKING EQUIPMENT
MECHANICAL PRESSES
...50 TO 3000 TONS



Irregularly shaped holes are pierced in this stainless steel jet engine part to very close tolerances—automatically.



SLOTTED OR PHILLIPS HEAD

The simpler way to save * on fastenings to metal and plastics

PARKER-KALON Hardened Self-tapping Screws

Originated by P-K, first choice today for fastenings to sheet metal, structural steel, non-ferrous castings and forgings, plastics, plywood, hard compositions. Here's why:

FASTER. No tapping. Simpler, faster than machine screws, riveting, or bolting. Cuts a standard machine screw thread as it's turned in.

STRONGER. No loose fits, mistapping, or cross-threading. Lasting tightness under vibration proved in millions of applications.

LOWER COST. Saves tapping time and tool expense, permits use of power drivers for faster assembly.

IF IT'S P-K . . . IT'S O.K. For guaranteed quality, get the Original, — specify P-K. Samples and application information free. Ask your P-K Distributor or write: Parker-Kalon Division, General American Transportation Corporation, 200 Varick St., New York 14.

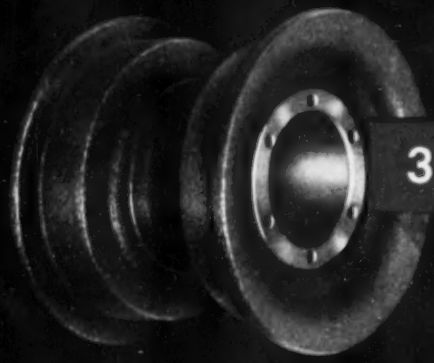
* Up to 50% and more. Ask a P-K Assembly Engineer to help you estimate your saving.

PARKER-KALON®

The Original **SELF-TAPPING SCREWS**

The INDUSTRIAL DISTRIBUTOR steers your Supply Dollars to the best values.

Automation PLUS Flexibility

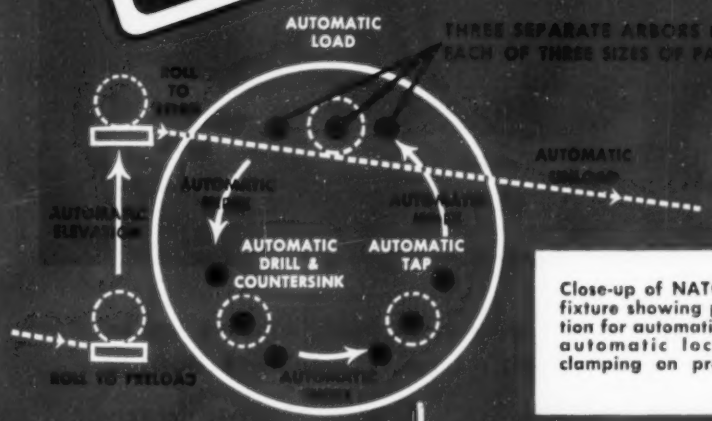


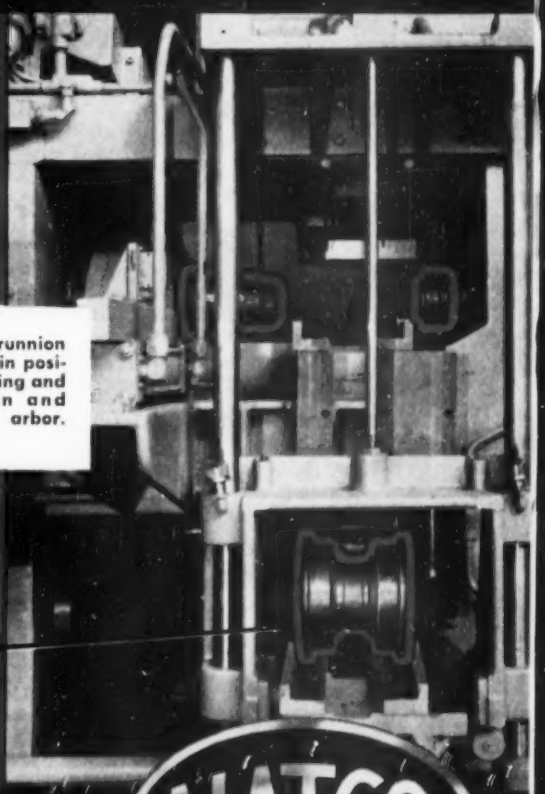
3 SIZES of TRACK ROLLERS

(Both right and left hand parts)
Automatically
Loaded and Unloaded
Drilled, Countersunk
and Tapped (Both Ends)

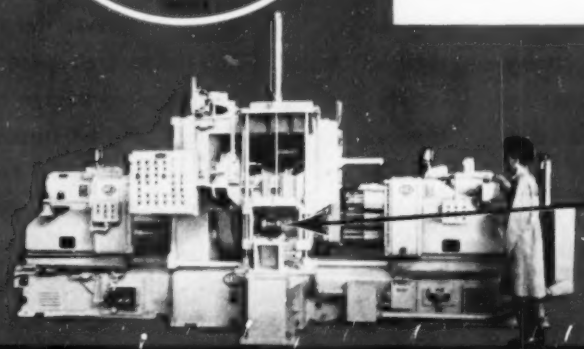
NATCO ENGINEERED for Quality and Quantity Production.

70 PARTS PER HOUR
ON THIS NATCO 2-WAY HOLESTEEL





Close-up of NATCO trunnion fixture showing part in position for automatic lifting and automatic location and clamping on proper arbor.



Call a Natco Field Engineer
to help you solve your problems in
Drilling, Boring, Facing and Tapping.

NATCO

NATIONAL AUTOMATIC TOOL COMPANY, INC., Richmond, Indiana

Branch Offices

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Davis "Super Micrometer" stub boring tool sets give you greater machine use by eliminating cut-and-try boring. They are extremely rugged, adjustable to .0001 in.

With these handy, production-boosting tool sets you have high precision tools for handling heavy boring assignments from ⅜ to 7 in. diameter . . . light, extended boring up to 13 in. diameter.

Set No. 11 (illustrated) contains seven stub boring tools covering a boring range from 1½ to 7 in. It is one of the ten complete, convenient, standard sets for you to choose from.

Modifications in any set can be made to meet your exact requirements.

Available for almost immediate delivery, these sets are all equipped with high-speed steel cutters. Stellite, super-high-speed steel or tungsten-carbide tipped cutters can be furnished upon request. Some sets include offset boring heads, pencil boring heads and reducing sleeves . . . plus setup items such as parallels, adjustable stop jacks and T-slot parallel blocks.

See your representative or write for details.

If Davis can't bore it — it can't be done

Davis Boring Tool Division

GIDDINGS & LEWIS MACHINE TOOL COMPANY

FOND DU LAC, WISCONSIN

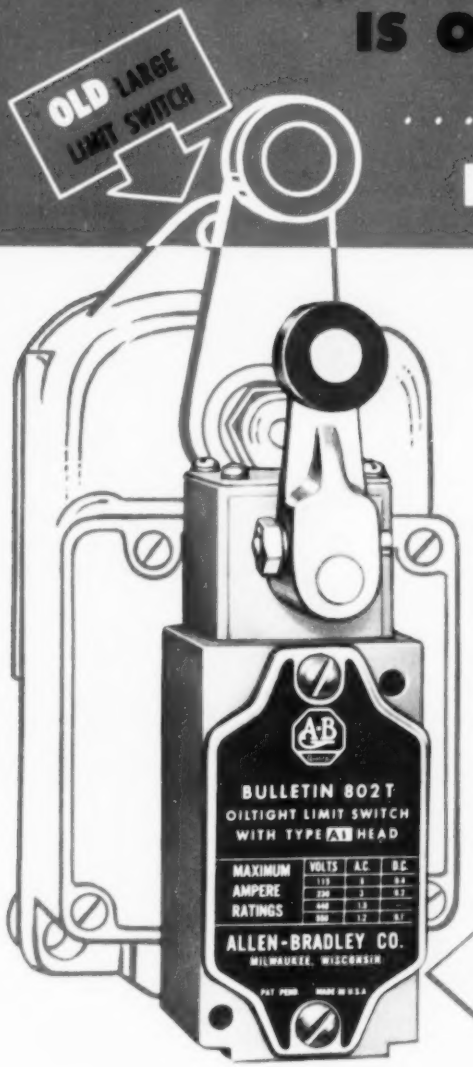
Builders of plain and micrometer adjustable block type boring tools; line boring bars; special boring tools; car boring tools; planer, vertical boring and turning mill tools; Quick Change arbors and sleeves.

OVERSIZE

IS OFTEN A HANDICAP

. . . . . *especially in*

LIMIT SWITCHES



Limit switches are intended for switching pilot circuits only. Hence, nothing is gained in making limit switches large and heavy. In fact, the excessive impact of high inertia, oversize parts may actually shorten the working life of the moving elements and contacts.

Look at the new, compact Allen-Bradley limit switch. Compare it with the old, oversize unit. The new limit switch has no useless bulk . . . no excess weight . . . yet it is good for millions of trouble free operations.

Quickly Adapted to Any Location . . .

The Bulletin 802T oiltight limit switch has double break, maintenance free, silver contacts.

Various operating heads are available with different types of push rods and levers. Limit switches in flush type construction can also be furnished.

The operating heads may be mounted in any one of four positions to fit any location on your machines. Since operating heads are interchangeable, the heads and bases may be stocked separately . . . and thus simplify your inventory problems.

NEW SMALL A-B LIMIT SWITCH

The Bulletin 802T oiltight limit switch is a real pacemaker in up-to-the-minute design and performance. It is rated for operation on alternating or direct current at 115, 230, 440, and 550 volts. If you use limit switches, by all means send for our illustrated Bulletin 802T which shows the various types of operating heads available for various limit switch applications.

A-B Quality

Allen-Bradley Co., 1316 S. Second St.
Milwaukee 4, Wisconsin

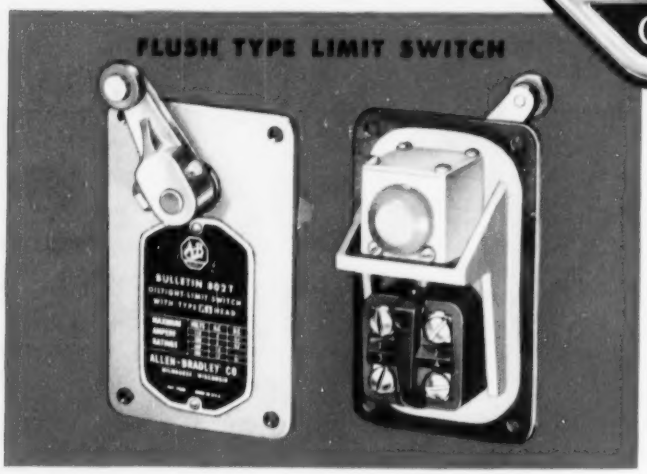
ALLEN-BRADLEY
quality
LIMIT SWITCHES

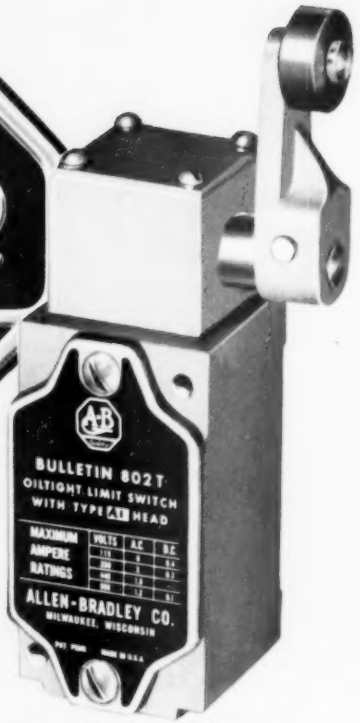
9-53-MR

OILTIGHT LIMIT SWITCHES

A-B Quality

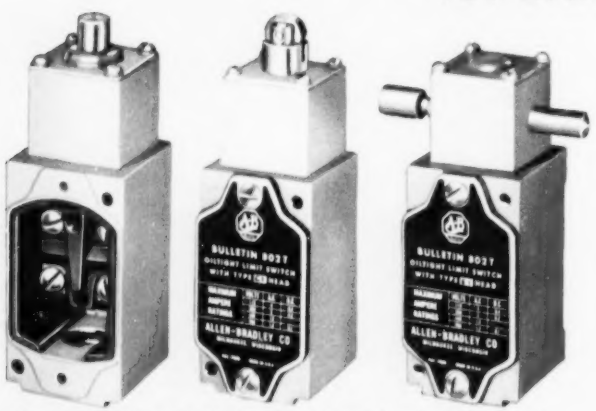
The Sign of Quality in Motor Control





The operating head, with lever or push rod, may be set in 4 horizontal locations, each 90 degrees apart.

A COMPLETE LINE OF COMPACT, DEPENDABLE LIMIT SWITCHES FOR OILTIGHT MACHINE TOOL SERVICE

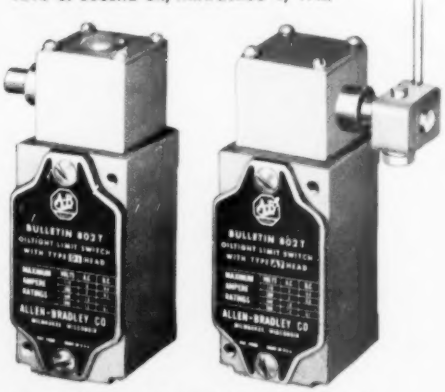


Operating heads are available with various push rods and levers. The switch is a single pole, snap acting unit, with one normally open and one normally closed contact, electrically separated. Most of these limit switches can be supplied for spring return or maintained contact operation.

The compact, streamlined design of these Bulletin 802T limit switches marks a new advance in motor control engineering.

The name plate cover has a synthetic rubber gasket to exclude oil. Terminals are easily accessible by removing the name plate. The switch body is threaded for ½ inch conduit. Let us send a sample for your inspection.

Allen-Bradley Co.
1316 S. Second St., Milwaukee 4, Wis.



Bulletin 802T oiltight limit switches can be mounted from the front, using the two clearance holes shown above. For mounting from the back, two tapped holes are provided in opposite corners.

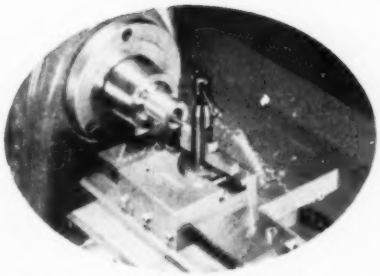
ALLEN-BRADLEY QUALITY LIMIT SWITCHES

9-53-MR

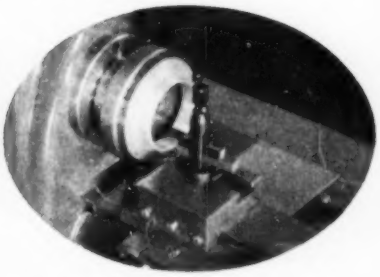
HARDINGE
ELMIRA, N.Y.

HIGH SPEED PRECISION LATHE

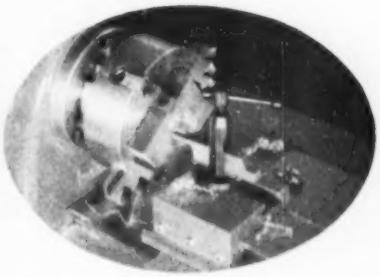
Correct Size - High Speed - Precision Results



Collet Work — The right machine for collet work of one-inch or less diameter.



Step Chuck Work — For rapid and accurate holding of tubing, castings, moldings, stampings and machined parts. Capacity to 6".



Jaw Chuck Work—Integral mount, universal or independent, for extra accuracy. Capacity to 5".

SPECIFICATIONS:
1" Collet Capacity
9" Swing
17" Center Distance
8 Speeds to 4000 rpm.

The above three important requirements for proper lathe work in tool rooms, production departments, or laboratories are completely fulfilled by the new Hardinge DV59 High Speed Precision Lathe.

Correct size of the machine in relation to work saves loss from under-capacity production on larger lathes. High spindle speeds, up to 4000 r.p.m., permit full capacity cutting and excellent finish. Sustained accuracy and ease of operation assure precision results.

Send for Free illustrated Bulletin DV 59

HARDINGE BROTHERS, INC., ELMIRA, N. Y.
PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE

Known 'round the World for Dependability —

DODGE-TIMKEN

★ In millions of installations Dodge-Timken bearings have proved their ability to cut costs and increase production. Their dependability is unquestioned under every condition of service. Available in five different types, including the new Dodge-Timken All-Steel Pillow Block for grueling, heavy duty jobs. All are sealed both on and off the shaft.

Dodge-Timken bearings are fully assembled and lubricated — ready to lock on the shaft. They are normally available from distributors' stocks . . . in a wide range of sizes. Call your distributor or write us for Dodge-Timken bulletins.

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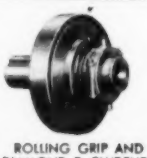
1878 DODGE 1953 75th ANNIVERSARY

CALL THE TRANSMISSIONEER, your local Dodge Distributor. Factory-trained by Dodge, he can give you valuable assistance on new, cost-saving methods. Look for his name under "Power Transmission Machinery" in your classified telephone book.

TORQUE-ARM SPEED REDUCERS



ROLLING GRIP AND DIAMOND D CLUTCHES

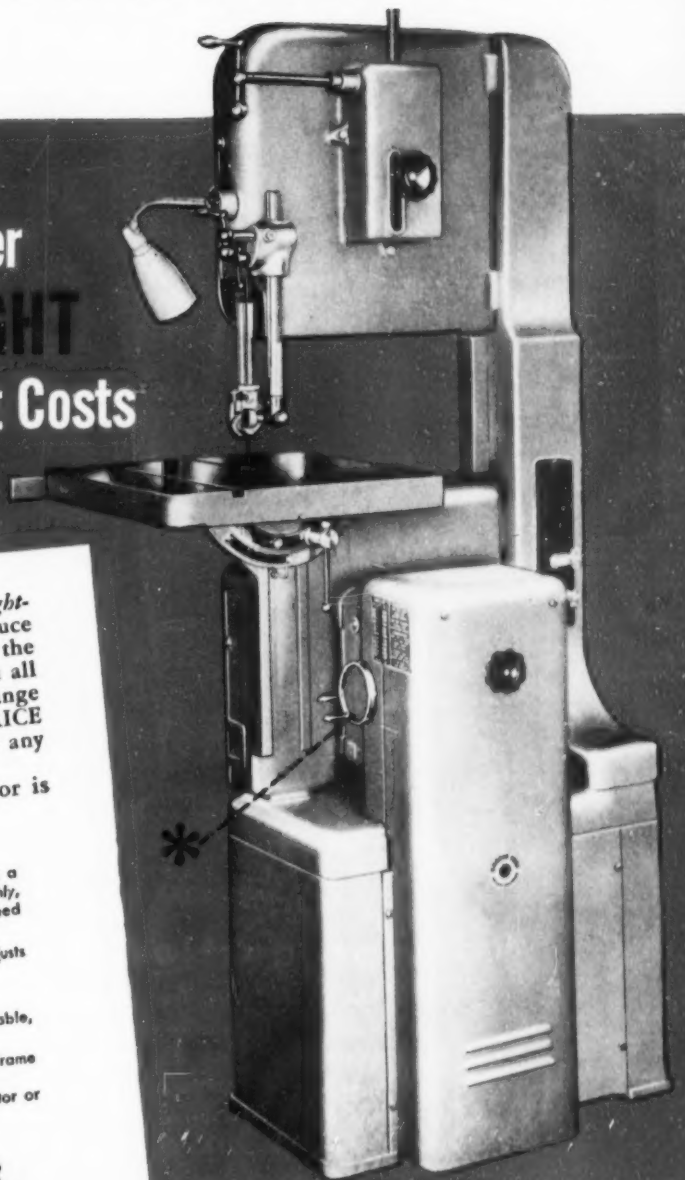
TAPER-LOCK SHEAVES; SEALED LIFE V-BELTS

NAME PLATES

FOR YOUR NAME PLATE REQUIREMENTS, WRITE OUR SUBSIDIARY, CHICAGO THRIFT-ETCHING CORPORATION, 1535 N. SHEFFIELD AVENUE, CHICAGO 22, ILLINOIS

NEW 16" Band Saw with Speeds 50 to 4500 SFM

another Walker-Turner LIGHT-HEAVYWEIGHT to Knock Down Equipment Costs



Now, Walker-Turner brings you another *Light-Heavyweight* champ . . . another opportunity to reduce equipment costs. It's a 16" Band Saw with all the quality and efficiency features you want . . . with all the capacity and durability you need for a wide range of jobs, metal, plastic or wood. And, at a PRICE MUCH LOWER than you have ever known for any comparable machine!

Your factory-trained Walker-Turner distributor is ready to tell you about: —

* **Quick-change Variable Speed Drive.** As easily as dialing a radio, you turn the hand wheel and change blade speed smoothly, while machine runs. No need to change belts, pulleys. Speed shows on a graduated scale.

Improved Saw Guides. Upper and lower leaf type . . . adjusts to all blade widths. Ball-bearing rollers.

Carter Jiffy Tires for longer life, smoother operation.

Capacity:—Blade to frame 16 in. Upper guides to table, max. 8 in.

Other Plus Values:—New base, extra weight, new rigid frame and body design, available accesories, etc.

Get all the facts. Just phone local Walker-Turner Distributor or send coupon.

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The COPYMATIC Tracer-Controlled Lathe proves that accuracy at production rates *is* possible and profitable. In unanimous reports, owners state their Lodge and Shipley COPYMATICS save up to 87%, pay for themselves in a year or two! Write for NEW Catalog No. 216. *The Lodge & Shipley Company, 3055 Colerain Avenue, Cincinnati 25, Ohio.*

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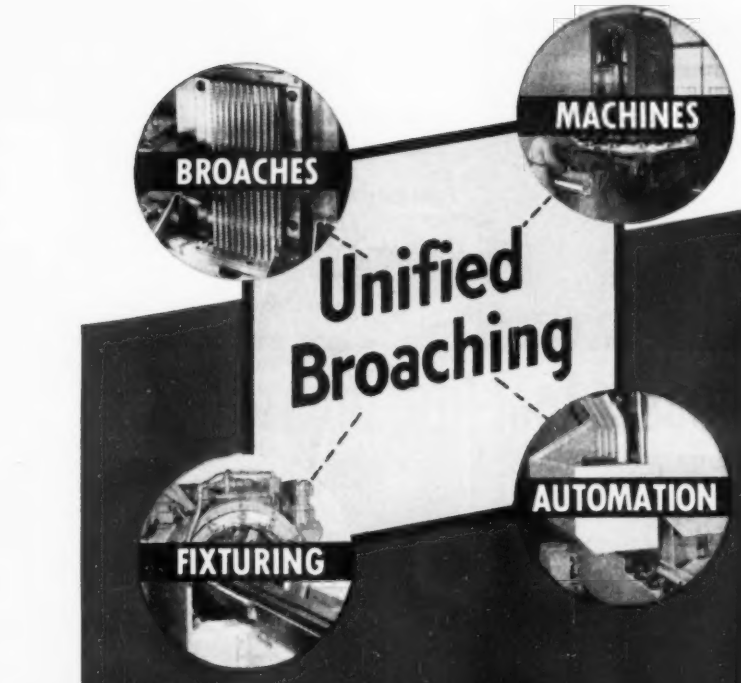
....your **LODGE-ical** *choice!*

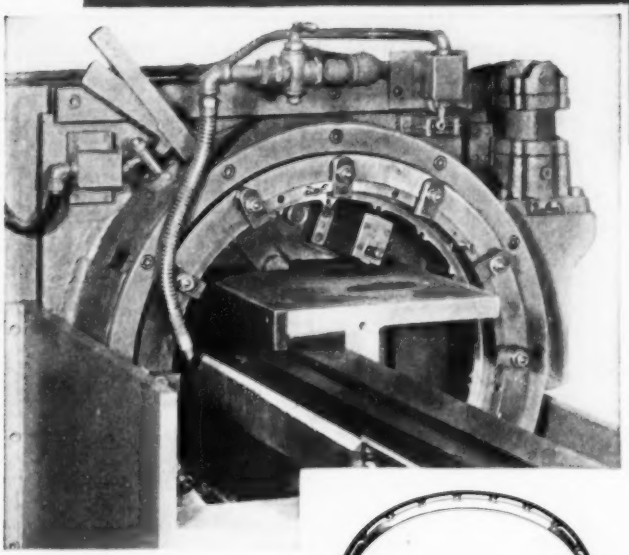


Methodized Broaching

the COLONIAL method

At Colonial, experience, imagination and competence are applied

1. to the design and manufacture of each of the individual components of a complete broaching installation, and
2. to the effective combining of ALL components into a completely UNIFIED BROACHING installation—making them work as a "team."



2 Colonials Broach JET BLADE SUPPORTS

Heat and corrosion resistant steel 22¾" I.D. jet engine blade supports, are broached on internal contours on two 10-ton 90-in. stroke standard Colonial horizontal machines at 3 per hour. 18 passes are required per machine. Metal approximately ¾" deep, 3½" wide, and ½" thick is broached in two passes.

Machines, broaches, fixtures, etc., were all designed by Colonial as a UNIFIED BROACHING INSTALLATION.

WHAT'S AHEAD IN BROACHING?

Keep up with the latest developments: Read "Broaching News". We will be glad to see you get it regularly if you will drop us a line on your company letterhead.

PIONEERS OF HSS BROACHING

COLONIAL BROACH CO. DETROIT 13

STANDARD ENGINEER'S REPORT

DATA

LUBRICANT Calol Cutting Oil 39-DA

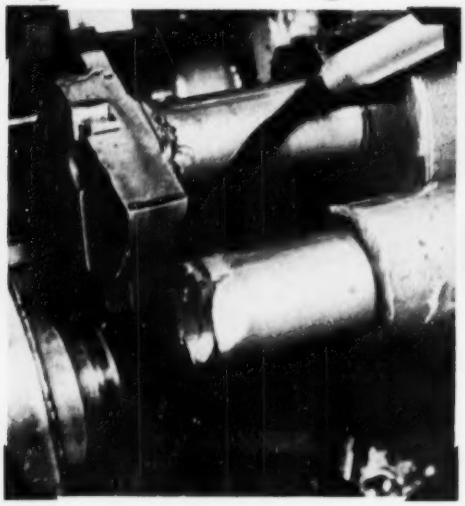
UNIT Automatic screw machines ½" to 5¼"

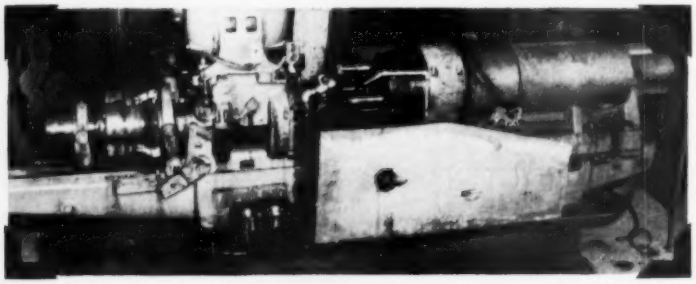
LUBRICATOR Circulating

SERVICE Machining spun cast stainless steel

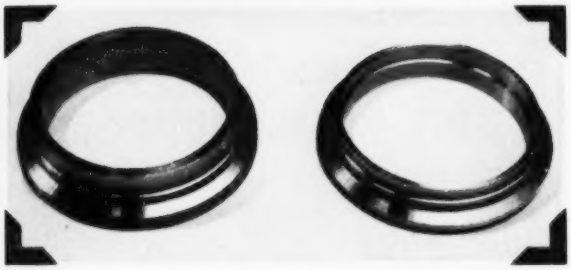
FIRM Speedway Engineering Co., Montebello, Calif.

Special cutting oil boosts tool life, improves finish!





WHEN CALOL CUTTING OIL 39-DA replaced a competitive oil on this 4½-inch Cleveland Automatic Screw Machine, it greatly increased tool life, improved the finish, and produced the close tolerances required in machining spun cast stainless steel. Tool life on this machine now averages 8 hours. The aircraft flange being worked at left, requires a 100 micro-inch finish and a final tolerance of 0.0015 inch. The Speedway Engineering Company has found Calol Cutting Oils completely uniform and able to handle efficiently any work in their shop.



THE HIGH FINISH OBTAINED with Calol Cutting Oil 39-DA is shown in this comparison photograph. The spun cast stainless steel flange (left) has been rough cut, while the other (right) has had final machining. This shop also uses Calol Cutting Oils on engine and turret lathes, milling machines, and drill presses.

FREE CATALOG: "How to Save Money on Equipment Operation," a handy booklet full of valuable information, is ready for you. Write or ask for your free copy today.

CALOL

TRADEMARK "CALOL" REG. U.S. PAT. OFF.

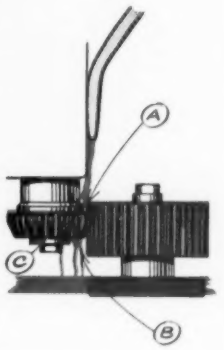
How to increase efficiency in all metal-cutting operations

Use the correct Calol Cutting Fluid for any operation from grinding to broaching. Recommendations for each are made from actual working results.

A. Have high cooling and lubricating qualities—minimize "built-up edge" and promote good finish.

B. Flush away cuttings readily.

C. Protect machine and work against rusting and corrosion.



FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor handling them, write or call any of the companies listed below.

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THE CALIFORNIA COMPANY
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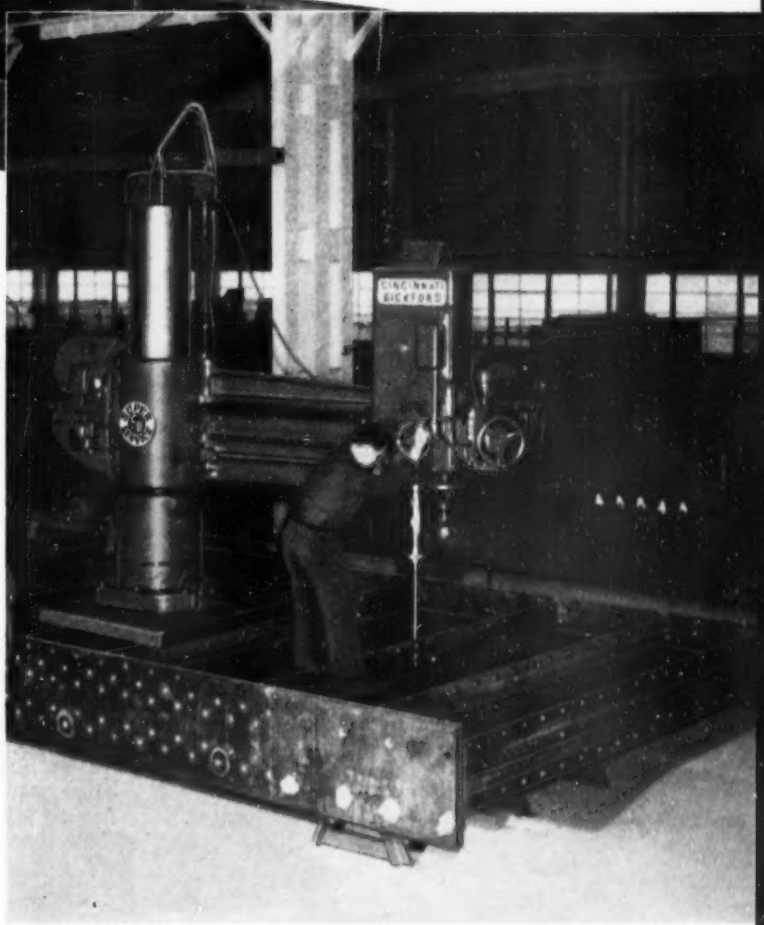
CINCINNATI BICKFORD

saves 50% to 75%

AT LINK-BELT COMPANY

Instead of positioning this 57,100 pound girder for drilling operations, the machine is moved by crane to the job.



This 6-foot arm, 17-inch diameter column Cincinnati Bickford Super Service Radial Drill is equipped with a lifting bail for portable use on large structural members and base plates where it is much faster to move the machine than the work. The machine is never clamped to the piece or floor for these portable drilling operations since it is properly balanced and of ample weight to neither tip nor rise up while drilling. Various sizes of holes are drilled in the part shown. Savings of 50 to 75 per cent over the previous method which used two men and a portable air drill, have been effected.

Photos made at the new Link-Belt Company plant in Colmar, Pa.

CINCINNATI BICKFORD

RADIAL AND UPRIGHT DRILLING MACHINES

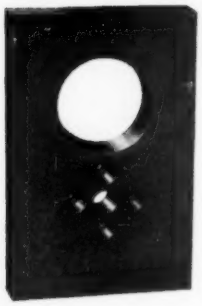
THE CINCINNATI BICKFORD TOOL CO.

Cincinnati 9, Ohio, U.S.A.

YOU GET *SPEED*

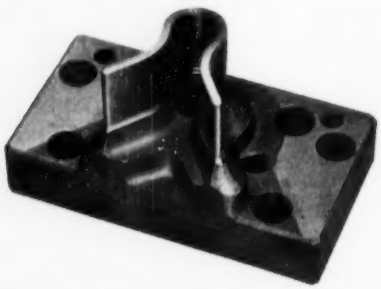
PLUS ACCURACY

WITH MOORE JIG GRINDERS



HOLES from 1/64" to 8" Relocated and Ground within .0001" in One-Third Previous Time

Before hardening, this two-station die block was Moore-Jig-Bored to eliminate the need for excessive grinding. After hardening and surface grinding, all holes were Moore-Jig-Ground to exact size and location. Blank hole and center piercing hole were ground with ½° included taper. Little clearance could be allowed between punch and die. Jig grinding time: *only 2¾ hours.*



CONTOURS, Too, Accurately Jig Ground and Checked in One Setting

This flanged punch, impractical to grind by any other method, was a natural for the No. 2 Moore Jig Grinder. All radii—male and female—were ground accurately to location and size. The piece, having been set up on a rotary table, was aligned to permit grinding of the angular surfaces. And the entire contour was inspected by the "indicator measuring" method while the punch was still on the machine.

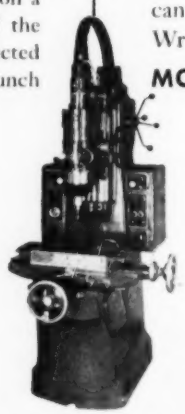
The word "versatile" must have been coined for the No. 2 Moore Jig Grinder. Not only does this machine relocate and grind straight and tapered holes with ease, but it contour grinds, chop grinds and slot grinds just as skillfully.

The Moore Jig Grinder, together with its toolroom teammate, the Moore Jig Borer, enables tool and die sections to be produced concurrently, puts diemaking on an interchangeable-parts-and-assembly basis. And it's also a time-saver on production jobs.

Employing the accurate lead screw measuring principle and a convenient system of coordinate hole location, the fast and sure Moore Jig Grinder eliminates hours of checking on bench and surface plate.

Why not find out how this remarkable machine can save *you* sizeable chunks of time and money. Write today for our detailed bulletin.

MOORE SPECIAL TOOL COMPANY, INC.
738 Union Ave., Bridgeport 7, Conn.



NO. 2 MOORE JIG GRINDER
Range 10" x 16" x 16" height. Grinding speeds from 12,000 to 60,000 rpm. Infinite feeds up and down; spindle-housing heat control. Features slot grinding attachment.

ADD MOORE TOOLS TO YOUR TOOLROOM

JIG BORERS · JIG GRINDERS · PANTO-CRUSH WHEEL DRESSERS · DIE FLIPPERS · MOTORIZED CENTERS · HOLE LOCATION ACCESSORIES

see our catalog in MACHINE TOOL CATALOGS or write for copy

...with TYCOL lubricants on hand!

A Cutting Oil with a "Delicate" Touch! Screw threading to fine tolerances is the acid test of any cutting oil . . . one reason why we ask: can your present oil measure up to Tycol Angrove 40? Take the customer who was threading 3/8" standard threads on 303 Stainless . . . with thread extending to the head . . . and the overall job calling for an extremely fine finish. The best of the competitive oils used yielded only 600 pieces before serration and burring appeared, necessitating regrinding the chaser. Tycol Angrove 40 produced some 4,500 pieces with no defects apparent under magnification . . . and with no regrinding of the chaser throughout the entire run! If you can't top this – contact your local Tide Water Associated office for further information!

Over 300 Tycol industrial lubricants are at your disposal . . . engineered to fit the job!

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Backlash

EXTRACTS FROM CURRENT LETTERS TO THE EDITORS

Pardon Us Mr. Davis

In final page make-up of the article "Universal Welder Reduces Welding Costs" (AM—Nov 9 '53, p 126) the name of the author, Edward F Davis, consultant manufacturing engineer, Headquarters Manufacturing Engineering Department, Westinghouse Electric, was inadvertently omitted. Mr Davis's name appears correctly on the contents page and in his biographical sketch on the Chips page (2) of the same issue. —Ed.

Still Room For The Small Shop

I recently ran across a small shop that interested me very much, especially as it refutes the idea that only the big shop now has a place, or a chance to survive. It is in a small town in an agricultural community, the only shop of its kind for miles. I'd been driving past it for well over a year, promising myself that I would stop and look it over the next time, but I never did until the other day. Then I did stop, and the foreman, of Italian birth, showed me through the place—a cement block structure.

This shop makes no standard product of any kind. It isn't making the "better mouse trap" we used to hear so much about. The word "Product" in the company name is the nearest approach to manufacturing that I found. It is really a job shop that handles a variety of work, from jigs and fixtures to subbases for some sort of a machine built many miles away. They have many kinds of machines so they can handle quite a variety of work. But, with few exceptions, the original builders of the machines would not recognize them, except for the names cast into the bed. There is, for example, an old Newton slab miller that is now a hydraulic planer that has proved satisfactory in every way; a complete changeover that was all done in the shop.

Lathes of various makes and sizes have been changed in several ways. Swing has been increased on most of them, in the old-fashioned way of using cast iron blocks under the head and tail stocks, to accommodate larger work than originally intended. An old knee-type miller that was practically a total loss, has been made serviceable by adding a Bridgeport milling head, the swinging head

GRINETICS

BY D G SMITH

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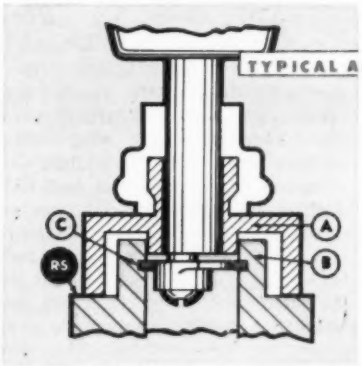
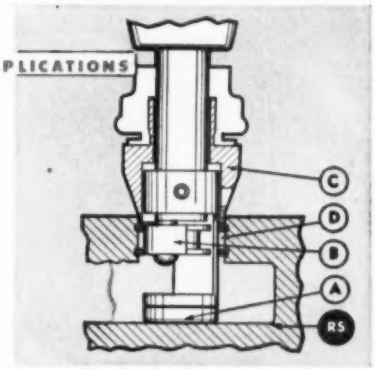
Waldes Truarc Grooving Tool Out-Performs Conventional Recessing Tools

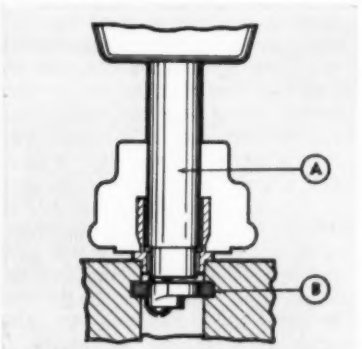
SAVES TIME! CUTS COSTS! NEEDS NO SKILLED LABOR!



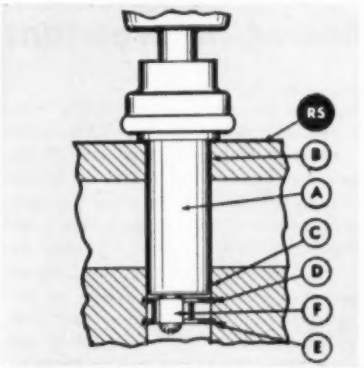
Clearing Obstructions or Protrusions – Waldes Truarc Grooving Tool with *special bushing* with high shoulder A in order to clear obstruction B on reference surface RS so groove can be properly located in bore.



Locating Grooves from Bottom of Hole or Blind Hole—Use of *bottom adaptor* A and double cutter B. Bushing C pilots tool into bore D while bottom adaptor acts as stop to locate grooves from reference surfaces RS below bore.



Small Diameter Bore — Need for Wide Groove – Great versatility of tools allows A-2 Tool to accept *stepped down spindle* and *cutter-shaft* assembly A. Provides cutting capacity in a bore normally within the range of smaller A-1 Tool. Illustrated, larger tool capacity necessary to cut groove diameter B exceeding normal capacity of standard A-1 Tool.



Extending Reach of Tool – Waldes Truarc Grooving Tool assembled with *extended bushing* A increases normal range of tool in order to reach proper groove location in bore. Bushing also registers on reference surface RS of workpiece while piloting tool at two points B and C inside bore. Two grooves D and E are cut simultaneously with double cutter F.

AMAZINGLY VERSATILE! The Waldes Truarc Grooving Tool adapts quickly and simply to your toughest recessing requirements. With it, even *unskilled labor* can perform and maintain high precision, mass production operations.

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AM 125

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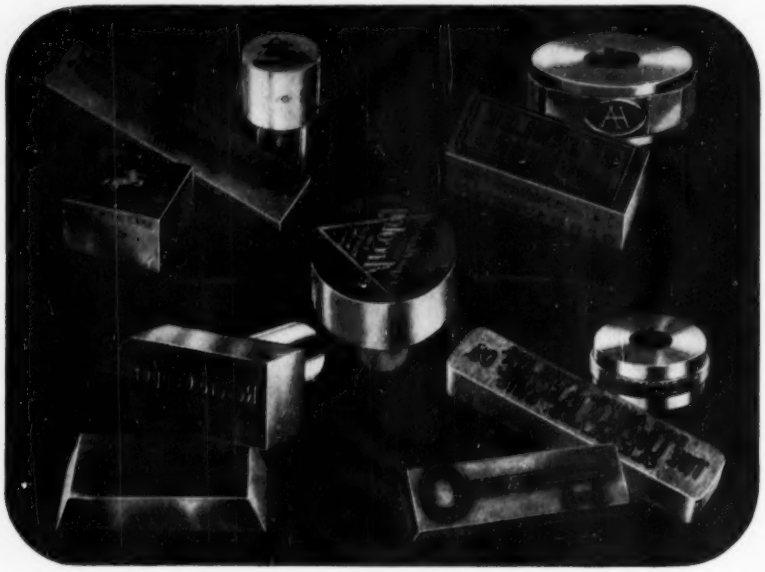

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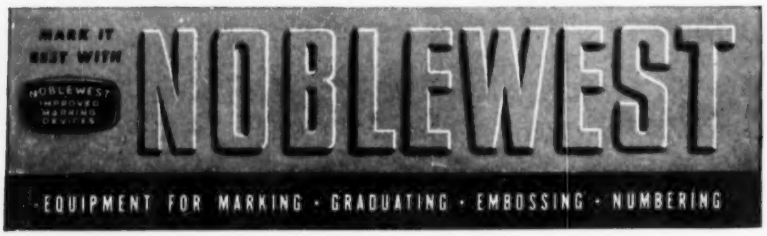

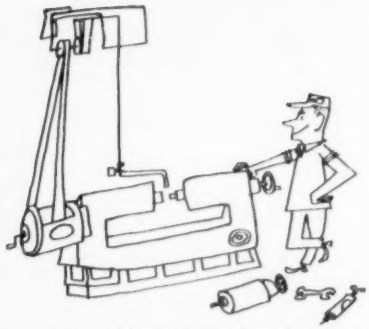

arm being fitted in the housing that carried the spindle bearings when the machine was built. The vintage of the machine was not visible.

An old American radial drill with a universal, swiveling arm, was receiving the last of its face-lifting treatments while I was there. A motor on top of the column now handles the raising and lowering of the arm, and other changes have made it an almost modern machine. They also have a complete, though small, heat treating department and several kinds of welding equipment.

It brought to mind some of the old shops I had seen a half-century or more ago, when what are now really going concerns were feeling their way by starting out with old machines that had to be so completely re-vamped that many modern machinists would think they were good only for scrap. I've no idea what it has cost this shop to rebuild these old machines, nor do I think for a moment that they would be economical for a production shop. But this is a live, going concern, which does work for large, well equipped shops perhaps 75 miles away and has been kept busy for several years.

It is possible that it might have been cheaper to have these old machines rebuilt by some of the used-machine-tool concerns who specialize in this sort of work. But by doing the work in their own shop they could keep their men busy at times when they might have been idle between contracts. Then too, the men who helped rebuild these machines cannot help feeling a real pride in them and do all they can to make them work to best advantage. It comes nearer to having the old, small shop spirit than any shop I've seen for some years.

While I do not as yet know the history of this particular shop, I am sure it was started by some ambitious mechanic who wanted his own little business, even if he might perhaps make more money working in some large plant. There are still good mechanics who feel just that

way. It is encouraging to find that, even in these days of multi-million dollar plants which are needed to produce the millions of automobiles and other things we need, men can still be successful in the small shop equipped with rebuilt machines. Making parts for the large plants, especially when we need more production of so many kinds, still makes a good business.

Not all men are rugged individualists enough to do this. Some excellent mechanics are very poor business men. But a successful shop of this kind should encourage men shy on capital but long on enterprise to own and run their own little shop. This shows it can still be done.

Fred H. Colvin
Point Pleasant, NJ

Addendum

The tool-control board pictured on page 129, AM, Oct 12, is actually a patented product of the Cross Co, Detroit, Mich. It is the first of its type. In captioning the picture, the words "Ford's tool-control board . . ." were used, meaning "owned by Ford," but inadvertently conveying the impression that it was Ford-developed.—Ed.

Tape and Tile

In the general view of the Press Department of the Duncan Electric plant (*AM* — July 6, '53) the "aisle lining is a special 3-in.-wide adhesive tape and tile is set in an oilproof and waterproof adhesive." Can you give me the name of the manufacturer of the tape, tile and adhesive for tile setting?

A E Fristedt
Stockholm-Bromma, Sweden

The adhesive marking tape is Minnesota Mining & Manufacturing Co's 2471 Traffic Lane Tape and is available in most colors. It is reasonably resistant to lifting from scuffing. The tile and adhesive are manufactured by the Tiletex Division of the Flintkote Co (1232 McKinley Avenue, Chicago Heights, Ill). This is a 3/16-in. industrial asphalt tile called "Tuftex" and is used at Duncan in all areas of the plant subjected to oil, including the screw-machine and press departments. Sawdust or other absorbent is used over it where oil splash is frequent around machines, in the same way as it would be used on any other type of floor. The tile, however, is very easy to keep clean, and encourages operators to do some cleaning themselves. — Ed.

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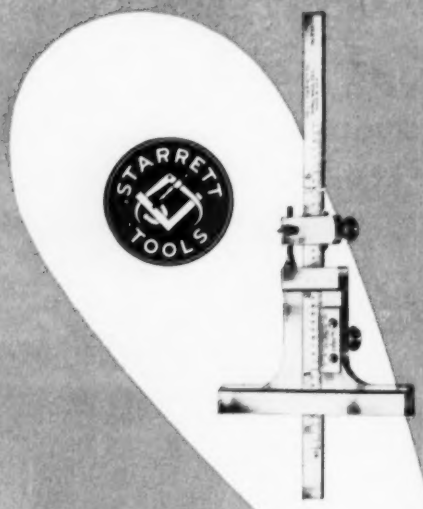

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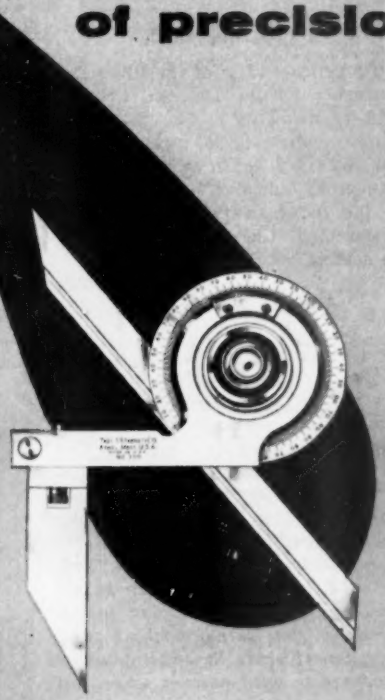

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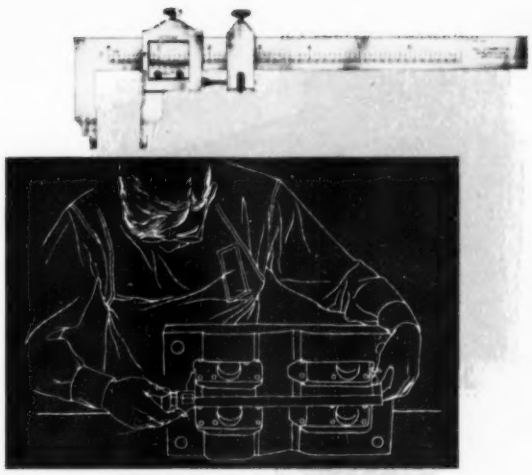

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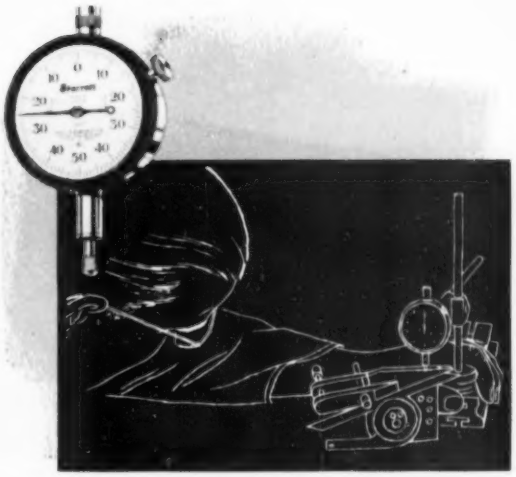

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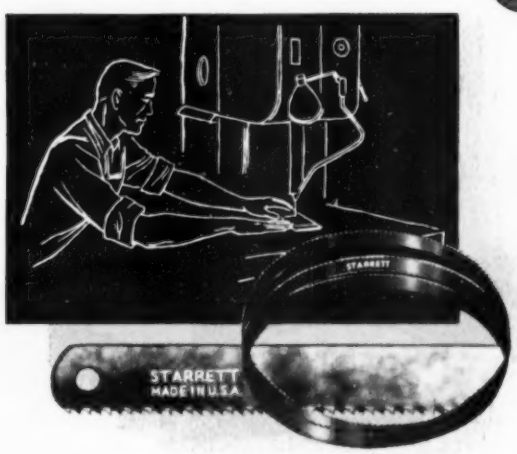

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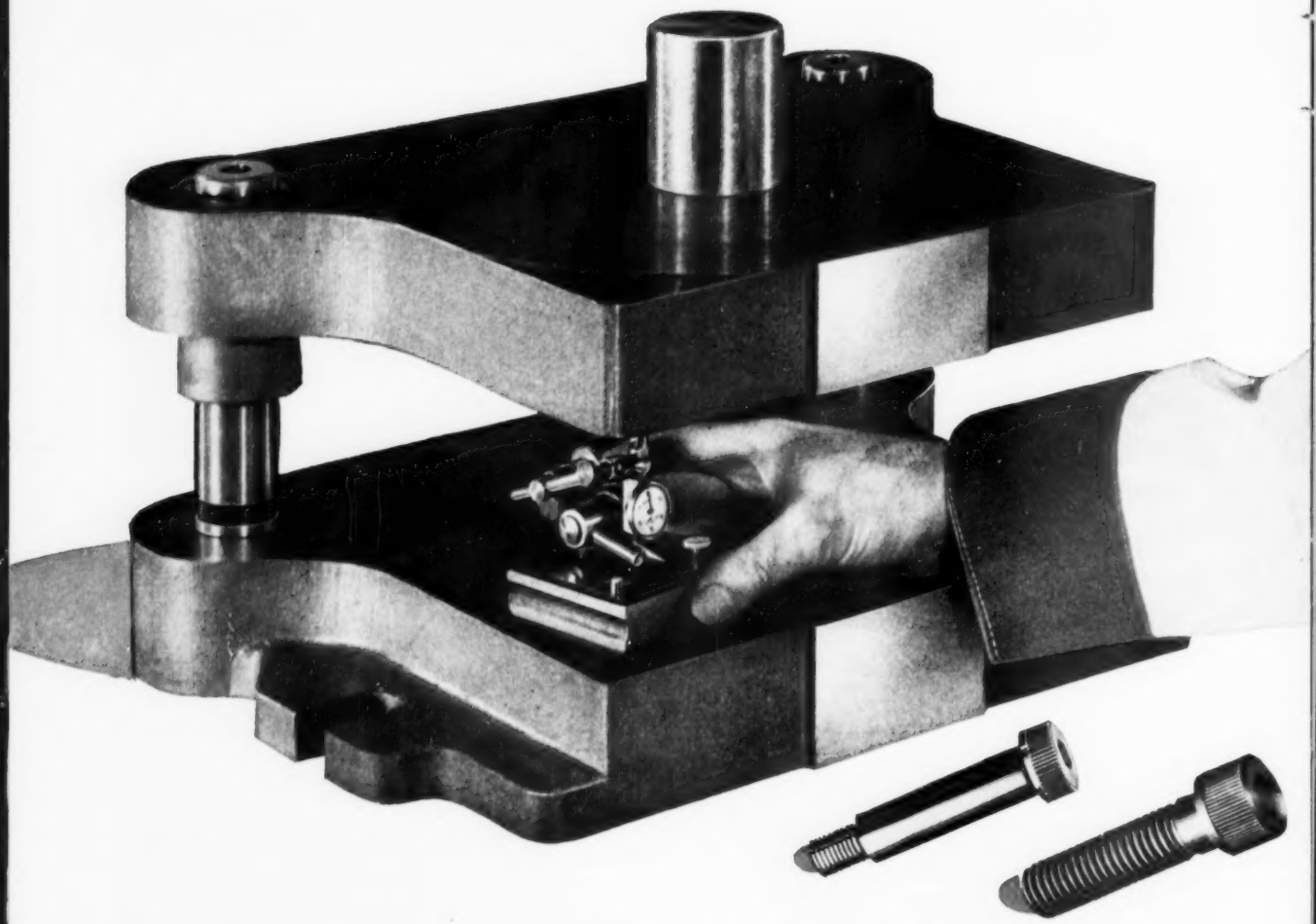

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SPOT NEWS of Metalworking

- **Brazil is in the market for $3.2 million worth of machinery and equipment.** The government-operated National Motor plant will need it to build completely made-in-Brazil trucks, with first production scheduled within two years.

- **Powdered metal piston rings, valve guides and seat inserts and tappets** are under test at Thompson Products. Results so far are good — parts are cheaper than cast iron: guides require no external lubrication, will end stuck valves.

- **Japan's Shoun Machine Tool Mfg Co will produce super-high-speed lathes** under license from France's Cazeneuve Works, to sell in the Orient. Lathe has hydraulic copying attachment, 500 mm swing on bed, 18 speeds, 40-3200 rpm range.

Allocation of steel, copper and aluminum to defense contractors has been simplified. Under new policy, direct allocations will be made only to direct defense contractors, absolving subcontractors from DMS bookkeeping and red tape. Subcontractors henceforth will be granted priorities through prime contractor's order number.

- **Resin-impregnated glass-fiber structures for compressor blades** on turbojets and turboprops are being developed by a Cleveland firm. Problem is to find resins that retain high strength at elevated temperatures.

- **McGraw-Hill's annual check on job turnover in industry** shows that of every 1000 key men, 460 stay at their jobs, 326 are replaced, 149 move to different locations, 65 change titles. Thus 54% switch jobs, move or quit each year.

- **Air Force will purchase some 15,000 more items directly or through GSA** as a further step in reducing its warehouse inventories. Included are: vehicle parts, hand tools, bearings, heating equipment, commercial electrical parts.

- **New gear analyzer allows observation of running action on contour projector,** eliminating need for interpolative data. Unit checks involute profile, fillet interference; outside, root and pitch diameters; backlash, tooth-to-tooth spacing, modified tooth form tapered teeth, crowning, contact points, off-axis teeth.

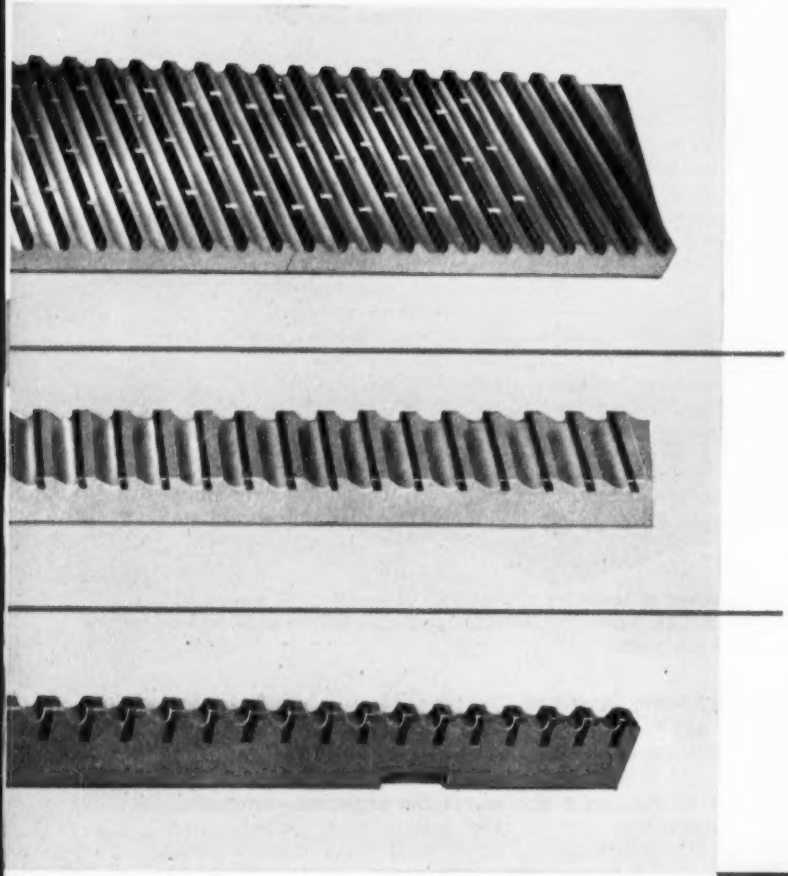
- **New York University engineering graduates' starting salaries are up 52%** over 1947, when the average was $227 and are 5% more than last year's starting wage.

Alloys of aluminum, magnesium, titanium and high-strength steels will come into greatly increased usage by the Army, per a recent Ordnance directive. Reasons: (1) to lighten the combat infantryman's load and cut weight of such supporting items as ammunition, vehicles, large-caliber guns, etc. (2) to make the infantryman "airliftable."

- **Civilian distribution of titanium sponge and titanium ingot and mill products** is now under control of the Business and Defense Services Administration. Purpose: to insure that defense industries get top priority without disrupting civilian markets to a degree that "creates appreciable hardship."

- **Self-locking anchor nut holder, made from short 1020 steel bolt** threaded at one end with a nut on the other and hollow tubing between, positions and holds anchor nut plates in alignment during riveting to structural parts.

WHEN BROACHING...
SAVE WITH CARBIDES



With Continental Carbide tipped broaches you'll get more pieces per grind, more pieces per broach, and more pieces per dollar. They are especially effective on cast iron parts.

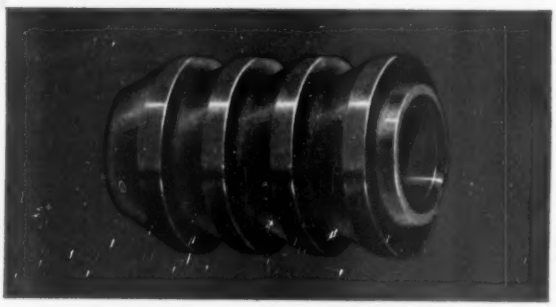
Carbide tips may be used in all the broach teeth or in the finishing teeth only. Continental Tool Works Division of Ex-Cell-O has the technical knowledge to help you; Continental has been designing and building solid carbide and carbide tipped cutting tools since 1930.

For information regarding your application, or for a quotation on carbide tipped broaches, just give your local Ex-Cell-O representative the details or write to Continental in Detroit.

TOP: Carbide tipped sections of a Continental Surface Broach. Note the chip breaker grooves in the semi-finishing teeth and the solid finishing teeth.

MIDDLE: Carbide tipped finishing section of a Continental broach used on a cast iron application.

BOTTOM: Rough cast-iron parts made it necessary to use this carbide tipped broach to obtain satisfactory tool life in cutting half-round slots.



Solid carbide shell used on the finishing end of a High-Speed steel broach to hold size in cast iron parts.

53-16

CTW

Continental TOOL WORKS

DIVISION OF EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN

Washington

Tariff scrimmaging has begun in earnest. The Randall Commission, which is supposed to blueprint the administration's definite foreign trade policy by March, is involved, on one hand, with a fierce intramural fight between its protectionist and free trade members and, on another, with effective opposition from Washington's revitalized high tariff lobbies.

Chairman Randall (Inland Steel's chairman) is still determined to get a free trade report out of his commission, and he's hopefully backed by top administration officials. But the temper of the commission's recent public hearings confirmed the skepticism of most observers, who now expect the commission to either (1) settle on a compromise which would mean little or no trade liberalization, or (2) issue majority and minority reports—one advocating weaker trade barriers, the other more protection.

All of which means the administration may have to abandon plans for a strong free trade program and try to merge the majority and minority reports into a single scheme. About the most it could hope for would be another simple extension of existing foreign trade legislation to stabilize tariffs where they are and make it a little harder for industries hurt by imports to get tariff relief. And even this won't be easy to get through Congress next year.

• • •

The Small Business Administration has loosened its purse strings. In a new liberalization of loan policy, the limitation on loans to companies in defense or essential civilian industries was dropped. The policy change had been anticipated since the recent ouster of William D. Mitchell as SBA administrator. Mitchell had incurred the wrath of many Congressmen, notably Senate Small Business Committee Chairman Thye, because of his conservative lending.

To add more luster to its liberalized lending policies, SBA has also made its first business loans: $60,000 to Alexander Milburn, Inc, Baltimore welding equipment manufacturer (in which a private bank will participate); $18,000 to Production Welding Co, Burbank, Calif, a custom welding shop; $25,000 operating capital, Texas Tool and Machine Co, Fort Worth manufacturers of tools and aircraft components (a local bank will participate in loan).

Ten other loans are now pending in Washington: four have been declined. In all, SBA's 30 regional offices have gotten 71 loan applications for $4.8 million. The new loan policy is expected to bring a spate of additional loan applications, mainly from small firms in the retail and wholesale trades.

SBA has set up a special project to evaluate applications for fast tax writeoffs from small machine shops. Project was set up in accord with ODM request. ODM grants defense amortization certificates, but has been reluctant to award writeoffs to small machine shops. Reasons: (1) ODM says there's no shortage of machine shop capacity; (2) difficulty in pinpointing small firm's role in defense production in many cases.

New SBA project will be headed by L Parker Fairlamb. He will help small machine shop operators in their applications for fast tax writeoffs from ODM.

• • •

New defense policy on strikes is to keep hands off. It's part of the program to keep government out of business but also it's geared to new thinking among top Pentagon labor advisors that nobody really benefits when the government steps in as third party on a strike.

The North American-UAW go around is a perfect illustration. Defense leaders refused to enter into negotiations even though deliveries of the F-86 Sabrejet, the country's top production fighter, have virtually stopped for over a month now. Reason is that pressure is off the need for the planes without heavy Korean losses and also, the Defense Department has a good inventory.

• • •

A strike over the guaranteed annual wage is not anticipated by the administration next year. Rank-and-file steel workers wouldn't support a strike on that issue alone. And the CIO won't risk it with little hope of White House backing. The annual wage demand is still considered trading material for higher wages and improved pensions.

Higher minimum wage and improved Social Security will be sought by the administration to divert organized labor's attention away from Taft-Hartley. Republicans have little chance of keeping their promise to amend Taft-Hartley.

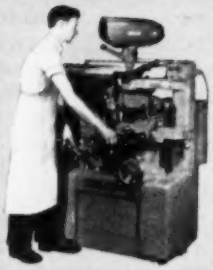
• • •

Military spending may run as high as $43.2-billion for fiscal 1954. That's a billion-and-a-half dollars more than Defense Secretary Wilson estimated when he whittled Truman's military budget. Result will be to run up the national deficit even beyond what the budget bureau said would be the limit this year.

Meanwhile, the military program for next year—fiscal 1955—is being worked out. Estimates right now place military spending for next year at about $38 billion with another three billion or so for arms aid to allies. That's a general reduction of about five billion over this year.

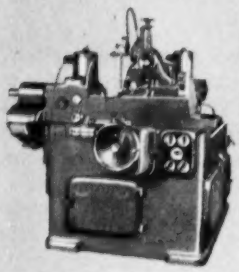
guard *PRECISION* in the shop

Micro-form Grinder, Model 121 grinds high precision profiles both flat and circular directly from large scale drawing, saving up to 75% over conventional practice.

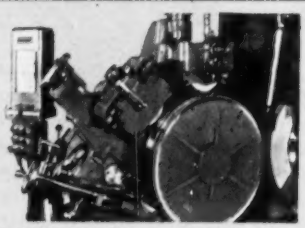


Micro-form Grinder, Model 122 equipped with a combination 30 power microscope and viewing screen.

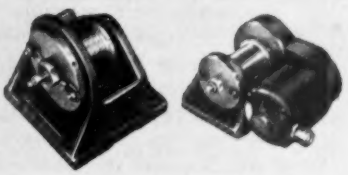
Thread and Form Grinder, Model 133 uses the multi-ribbed wheel principle to grind small precision threads and intricate forms on a high production basis.



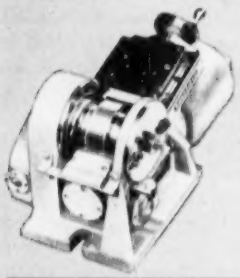
Precision Thread and Form Grinders —100 Series, produce precision threaded elements and cylindrical forms by the Crushtrue method, the diamond dressed multi-ribbed wheel or the single point wheel method.



Special machine tools are a Sheffield specialty, such as this one of 12 jet turbine shroud grinders placed in operation within the last six months.

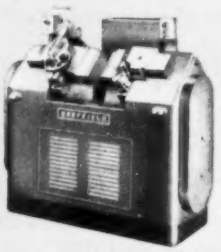


Idler and motorized type Crushtrue devices are available for forming grinding wheels on standard surface grinders.

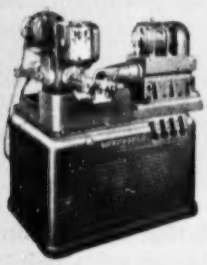


Self-truing Motorized Crushtrue Device forms surface grinder wheels for the grinding of flat form tools, etc. of the highest precision and uniformity.

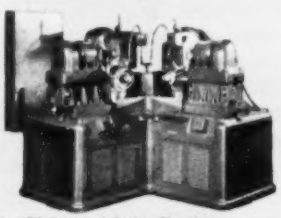
The Sheffield Crushtrue Roll Bank plan provides Rolls for production use while worn rolls are enroute to Sheffield for re-grinding and re-ground rolls are enroute from Sheffield for use. Nominal exchange charge.



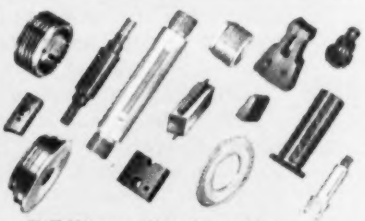
Gear and Spline De-burizers deburr or chamfer up to 600 gear teeth per minute. Applicable to spur, helical, hypoid, bevel and herringbone gears —also multi-start worms.



Gear and Spline Chamfering Machines chamfer, burr or recess the ends of gear teeth at high production rates—ideal for short runs and quick changeover.



Style "C" Gear and Spline Chamfering machines have two cutter spindles and two workheads for mass production gear manufacture.



Sheffield is prepared to produce precision threaded elements and formed parts on contract to augment your own manufacturing facilities.

CHECK THE BOX ☑ for any piece of equipment or service in which you are interested. Tear this out, attach it to your letterhead, mail to Sheffield, and detailed engineering data will be forwarded.

Machine Tool Division • The Sheffield Corporation
Dayton 1, Ohio, U. S. A.

MASTER CRAFTSMAN SHEFFIELD HEADQUARTERS

SHEFFIELD

6559

Detroit

Automotive engineers are almost as widely split in opinion over higher horsepower as is the general public. Even so, it seems apparent that horsepower will continue to climb.

Several engineers suggest that within the next few years, horsepower ratings of 300 or more will be relatively common. In view of the fact that at least two manufacturers have squeezed that much or more power out of present engines, no mechanical barrier will prevent achievement of that rating.

On the other side of the argument, more conservative engineers insist that horsepower has gone high enough, that sales department pitches should be toned down and that torque, instead of horsepower should be the main selling point. Large drawback to that suggestion is that too small a segment of the public understands torque. Industry sales organizations would have to educate the public.

Pattern most likely to develop out of the horsepower "race": natural forces will dictate future ratings. At some point, increasing horsepower will become too expensive to suit car buyers. Then sales and engineering departments alike will agree that they've gone far enough.

• • •

With Chevrolet's Corvette piling up praises everywhere, it was to be expected that Ford would add a sports model to its line, too. Entirely unexpected, however, was the release of such news by L L Colbert, president of Chrysler. Although they are usually privy to one another's secrets, auto company executives are not often inclined to comment publicly about competitors' plans. Colbert, with no ifs, ands or buts, notified a large gathering of reporters that Ford in 1955 would produce 15,000 sports models.

L D Crusoe, Ford Division general manager, says the car will be a "practical" sports model, giving substance to the thought that it will probably be designed more for family use than the Corvette.

• • •

Car output in late November fell to the lowest point of the year because of model changeovers at various companies. Chevrolet, which had been booming along at a 30,000-unit-a-week clip, produced a piddling 25 cars in the third week of November. Buick, too, which had been rolling as many as 10,000 cars a week off assembly lines built less than 700 cars that week. Even so, total car production for the year up to that time—5,665,873, according to Ward's Reports—was enough to install 1953 as second highest year in history. Combined with truck output, the total was over 6.7-million.

1954 outlook: Some of the semi-despair evident a few months ago is disappearing under the more optimistic predictions now being made for 1954. W E Fish, Chevrolet general manager, admitted he may have been too far over on the bearish side two months ago when he suggested that new car sales next year would run somewhere in the vicinity of $5.1 million.

Now he predicts without qualification that 1954 will be the third best auto year in history (it would have to exceed 1951's 5.3-million.) And hints that it may even be second best. To do that, it would have to beat this year's expected 6.2-million cars. Reasoning: many of the people who bought cars in 1950-51 (almost 12-million sales) can be considered as fair game.

• • •

Chrysler's cost-cutting moves continue. Latest: the corporation will begin producing its own power steering units for Chrysler and DeSoto in December. Tooling has been completed, and about 240,000-sq-ft of plant space has been allocated for power steering production facilities. Gemmer Mfg Co, supplier until now of power steering devices for both lines, will end shipments to Chrysler in the spring.

The Mexican Pan-American Road Race did not produce heated competition expected of it this year. Reason: Chrysler's 1954 models were barred from the large stock car category for reasons not clearly explained.

Last year, when Lincoln swept the first four positions as it did again this year, it was permitted to enter pre-production 1953 engines and to make certain modifications, including changes in the camshaft, installation of solid valve lifters used in Ford F8 truck engines, etc.

Figuring it could qualify with similar alterations, Chrysler last summer also introduced a "heavy duty" kit which, among other things, boosted its 235-hp V-8 to 290-hp. At race time, several thousand 1954 Chryslers were in the hands of the public, but the car was barred, although it was permitted to enter the sports car class, where it could not expect to compete successfully with such highly tuned mechanical jewels as Ferrari, Maserati and the winning Lancia.

• • •

Ford's Livonia Plant will continue a $5-million M-48 modification program through March, at which time an ordnance "layway plant" nearby will be completed and all government-owned equipment will be moved into storage. Some already is stored in completed sections of the warehouse. Engineering alterations will be made on over 500 M-48s. Once that is done, the Livonia plant will switch to full production of automatic transmissions.

Only ONE can be called the Finest:

. . . here's another good reason why:

CARLTON'S LOW HUNG DRIVE

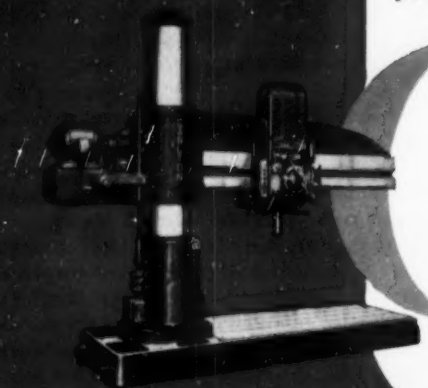
BRINGS THE HEAD *and* SPINDLE down to the work . . . not just the spindle.

Spindle accuracy and rigidity are assured *because the spindle is always close to the radial arm support.* This design eliminates spindle twist, which is one cause of vibration, thus reducing manufacturing costs by increasing tool life.

The main drive gear is placed in the *lowest part of the head.* It drives on the *largest diameter* of the spindle, *closest to the cutting tool* . . . a principle well established by its wide use in planers, lathes and milling machines. This permits the greatest amount of torque transmission.

Carlton's low hung drive . . . plus *all-ball-bearing construction, centralized pushbutton control, modern lubrication, 3-unit power clamping of arm, head and column,* and Carlton's many other advantages . . . means increased 'hole' production for you.

Write today for bulletins describing the Carlton Radial Drills you need. The Carlton Machine Tool Co., Cincinnati 25, Ohio.



Carlton radial drills

Machine Tools

First test case on leasing of idle government-owned machine tools for non-defense use is before the Office of Defense Mobilization.

Ford wants to lease 115 machines now installed at Brunswick Ordnance Co plant at New Brunswick, N J, to make parts for a new automatic gear shift. Brunswick is a subsidiary of Mack Truck.

ODM policy, announced recently, bans such leasing. But there is an "escape clause" to allow this kind of leasing in "extraordinary" cases.

Army Ordnance officials have asked ODM to approve the proposal. Civilian brass at Pentagon have given their blessing too. But officials in BDSA strenuously oppose this action.

It appeared likely at press time that Ford would secure ODM approval.

Mack's plant contains a production package of 450 machine tools valued at $4.5 million. The production line was set up to manufacture gear components for tanks, but has barely been used. Mack is storing the equipment for Army Ordnance under the Defense Department's program for maintenance of a mobilization base.

Mack is actively seeking the Ford subcontract. Mack officials have told the government that if the government-owned tools in their plant cannot be leased to Ford, they should be removed and put in a central government storage depot.

If Ford is granted permission to lease the 115 tools valued at $1.1 million, both Ford and Mack pledge that they will keep the whole package of 450 machines in good condition.

Ford already has on order for a plant of its own machine tools similar to those that it wishes to lease. It wants to use the government equipment until its own tools are delivered.

• • •

Defense Mobilization Director Arthur Flemming's reference to a "fourth expansion" in elephant tool capacity, revealed at the annual meeting of the National Machine Tool Builders Association, is a matter of government bookkeeping and not a new program for installation of additional government equipment in a private machine tool plant.

Mr Flemming apparently was referring to Giddings & Lewis which is covered by a facilities expansion contract under which $3.1 million of government machines have been installed.

This contract has increased Giddings & Lewis' capacity to build elephant tools by 84 units a year.

But up to now Giddings & Lewis has not been a formal participant in ODM's special elephant tool expansion program. The plan now is to include it in the program under a new contract.

That will mean that the production package installed at G & L will remain intact for 15 years.

Government is installing, apart from Giddings & Lewis, (1) $1.4 million of tools to produce 60 additional elephant tools a year at Onsrud Machine Works, Inc and has granted the company a fast tax write-off on its new plant; (2) $600,000 of tools at G A Gray Co to build 24 additional units a year. It also has granted a quick write-off to Consolidated Machine Tool Corp for a new plant with capacity for 35 elephant tools annually.

Even with Giddings & Lewis a formal participant in the program, the government still will be 247 units shy of its goal in January.

• • •

Shoun Machine Tool Co at Osaka, Japan, expects to build within a year 20 HB-500 precision lathes a month on a royalty arrangement with Cazeneuve of France.

This lathe has hydraulic copying attachment, 12-hp motor and bed swing of 500 mm. Shoun will sell it in Korea, Siam, Philippines, Formosa, Indonesia and Japan.

This is the second case of a tie-up between French and Japanese companies. First was made recently between Tsugami Machine Tool Mfg Co and Cri-Dan of France for latter's automatic screw cutting lathe.

BF

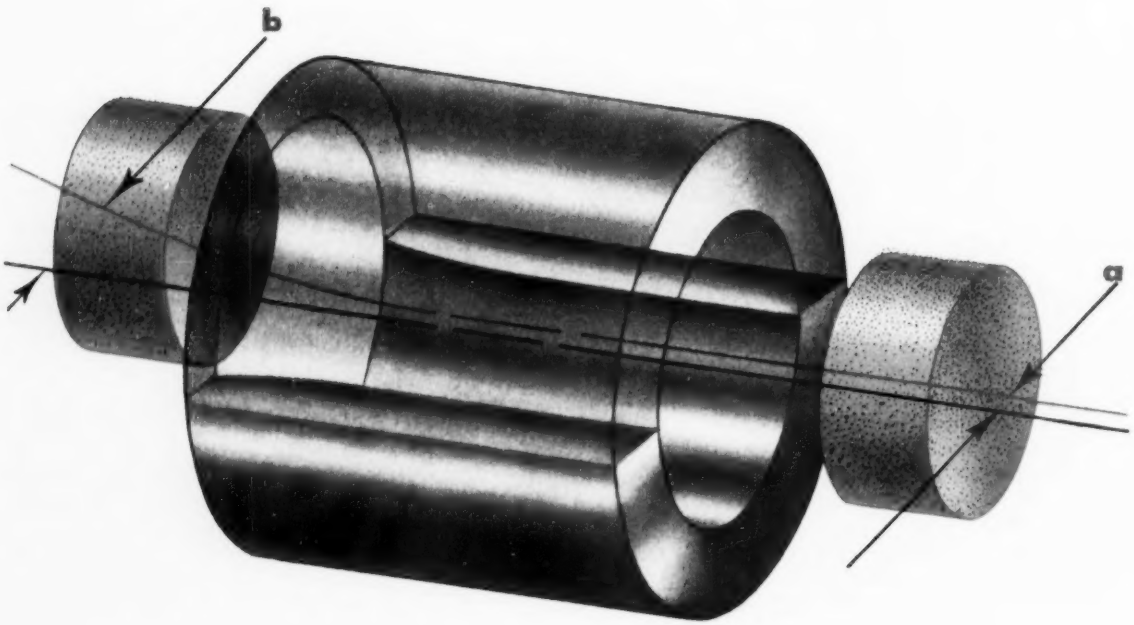
MACHINE TOOL INDEX

(1945-47 = 100)

(Source: National Machine Tool Builders' Assn.)

alignment

for better internal grinding

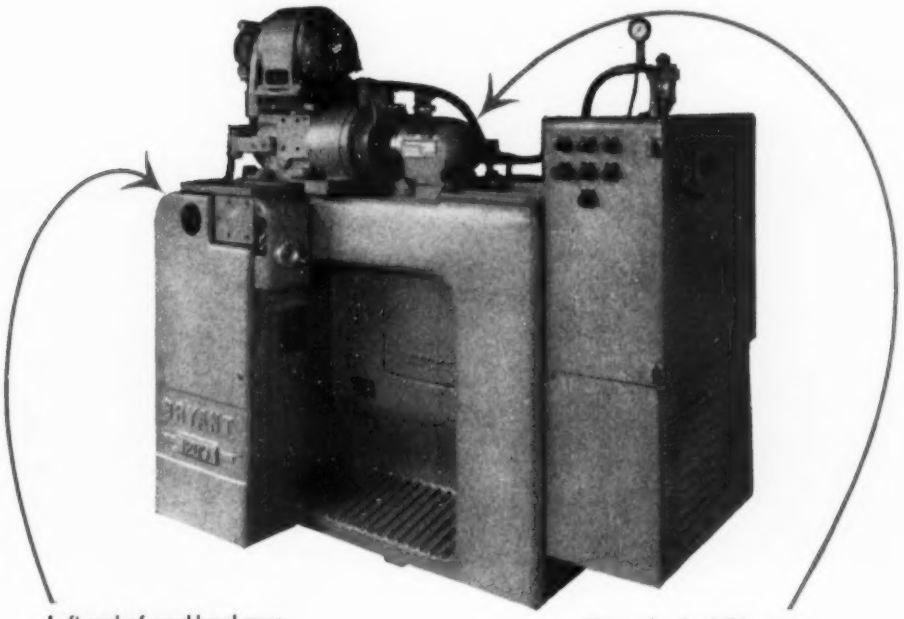


BELL mouth holes are a common internal grinding error. General available information advises simply turning the workhead or changing the length of traverse to correct this error, to generate a straight hole. In the case illustrated above, where bell mouth exists at one end of the hole, neither turning the workhead nor changing the length of stroke will correct this error.

In order to grind a straight hole the wheel must traverse the work in a straight line parallel to the axis of the work. The wheel path (the line in which the wheel traverses) is controlled by the slides under the wheelhead. If the slides are straight and true, the wheel path will be a straight line. If the path of the wheel varies from a straight line, the variation will be generated in the work.

At point "a" the wheel path and axis of the work are parallel and the wheel is set to grind a straight hole. Because of an error in the wheelslide

ways, the wheel path is distorted and the wheel is plunged into the back end of the work and the wheel path and work axis diverge as shown at point "b". Wheelslide error can introduce distortion of many types within the work in addition to the one illustrated. The remedy is to correct the wheelslide ways which will, in turn, straighten the wheel path. The wheel contact will be improved, resulting in better finish.



Left end of workhead may be raised or lowered to bring its axis into a plane parallel with wheelslide bar.

Rear of wheelslide may be adjusted to insure straight line motion of the wheel.

This machine is designed particularly for high production, precision grinding of bores up to 3" in ball bearing races, gears, rolls, bushings, etc. Operator merely loads work, trips a valve to start cycle and unloads the finished piece. The machine automatically rough grinds, finish grinds and returns to chucking position when finished size is reached. Wheelslide traverse is hydraulically operated, providing infinite traverse speeds and assuring smooth oscillation. Wheel speeds up to 100,000 R.P.M. are obtained with the Bryant Hi-Frequency Wheelhead. Write for folder.

Write for "Alignment" booklet which gives complete details on this interesting subject. Also ask for booking form on new sound, color movie — free showings arranged for engineering groups.

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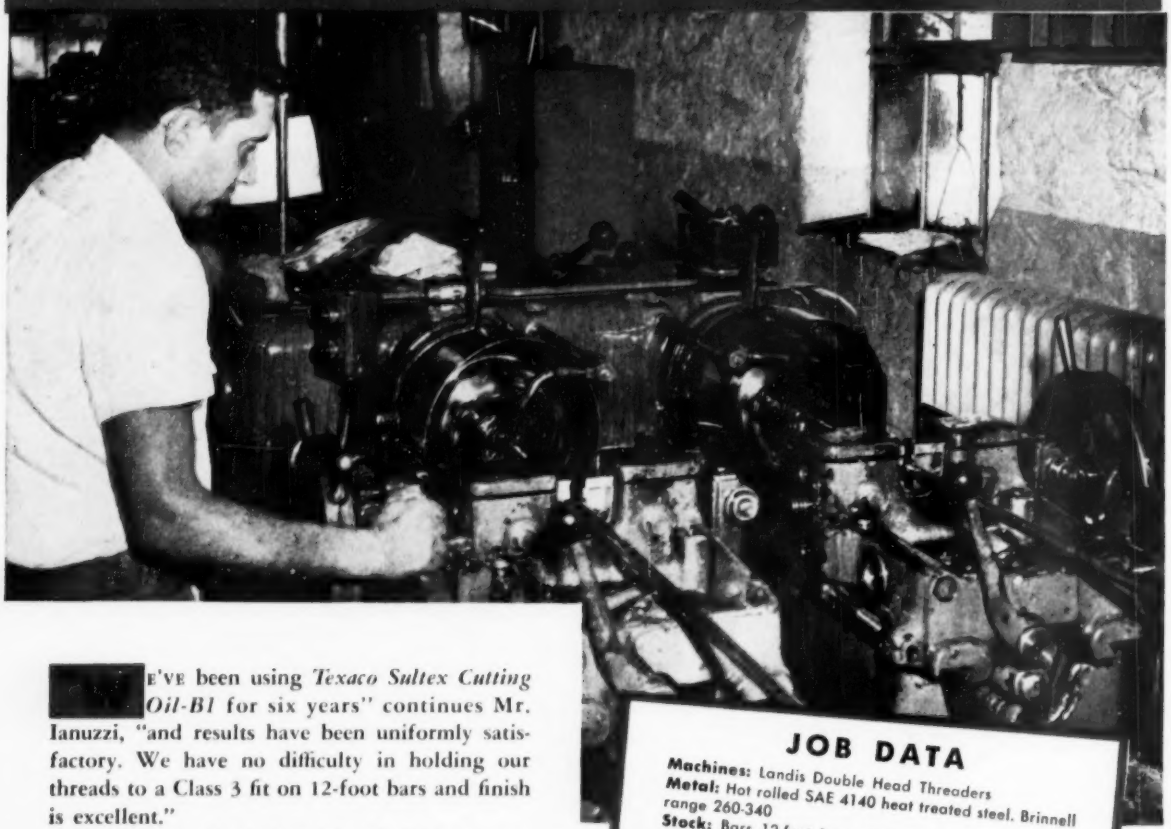
Springfield, Vermont, U. S. A.

Internal Grinders • Boring Machines • Internal & External Thread Gages • Granite Surface Plates

"Texaco gives us CLEAN CUT THREADS AND LONG CHASER LIFE"

says Emil Ianuzzi
Vice President in Charge of Production
R.E.C. Corporation, New Rochelle, N.Y.



"We've been using *Texaco Sultex Cutting Oil-B1* for six years" continues Mr. Ianuzzi, "and results have been uniformly satisfactory. We have no difficulty in holding our threads to a Class 3 fit on 12-foot bars and finish is excellent."

On cutting and grinding jobs of all kinds — on all kinds of metal — Texaco is helping operators work faster, get better results, and reduce costs.

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JOB DATA

Machines: Landis Double Head Threaders
Metal: Hot rolled SAE 4140 heat treated steel. Brinnell range 260-340
Stock: Bars 12-feet long, diameters from ½" to 2½"
Job: Threading bar entire length
Threads Cut: U.S. Vee, Acme and Buttris — 8 to 18 pitch
Cutting Oil: Texaco Sultex Cutting Oil-B1

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TEXACO

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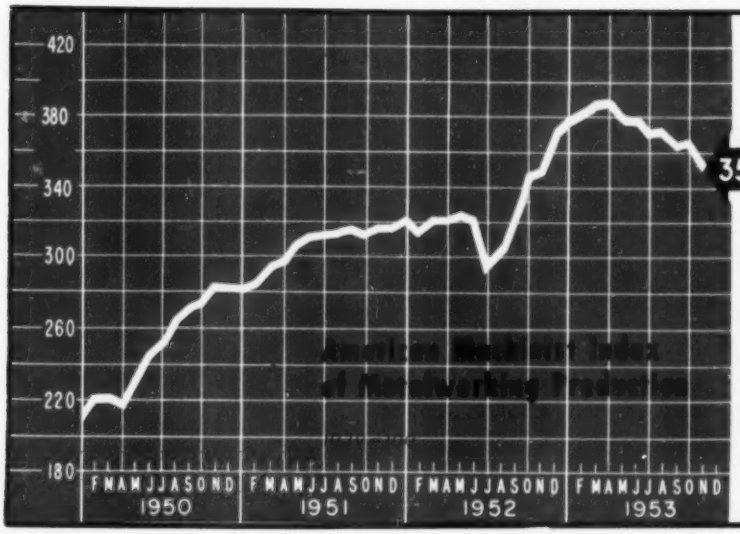
TUNE IN . . . METROPOLITAN OPERA radio broadcasts every Saturday afternoon. See newspaper for time and station.

Gaging Metalworking



PRODUCTION INDEX

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	NOV '53(*)	OCT '53(p)	SEPT '53(r)	OCT '52
Tot. Index	352	354	356	343
Machinery	313	315	309	
Electrical Machinery	413	418	398	
Autos	267	269	253	
Other Transportation	599	599	566	
Other Metalworking	352	354	346	

(*) Estimated (p) preliminary (r) revised

Metalworking production is pointing down but not steeply. November output was just under the rate in the same month a year ago. That means that operations have been holding up very well.

December promises to be lower than November, but that should not be a surprise or cause undue concern. For the fact is that the final month of the year traditionally is a period of let-down for many manufacturers.

There is hardly any line in Metalworking that has not sagged a bit lately. In a few cases the decline has been sharp.

Many managements are now engaged in a "holding" operation. They are hiring workers only to replace those who leave. On the other hand, they are not letting anybody go deliberately.

• • •

Caution prevails in relation to inventories. Manufacturers are careful not to build up stocks of materials and in-process work beyond the present point.

Talk about shortages of materials of almost all kinds has nearly vanished. The steel people are out after orders. And the non-ferrous producers are vigorously soliciting business.

Non-ferrous fabricating mills have reduced the work-week to four days because of the sizable drop in orders. How long the new schedule will prevail is anybody's guess.

Automobile production was off in November from October. It also was considerably below November 1952. Model changeovers were partially responsible. December is likely to do better as some manufacturers begin to stock dealers with 1954 lines.

Farm implement makers are realistic about the outlook, saying that in the next few months they expect to be in the lowest period in years.

They are not downhearted though. They believe that sales will pick up in the late winter and early spring. But they refuse to hazard a guess as to how the first half of next year will compare with the same half this year.

• • •

Household appliance makers are not doing badly for this time of year. Heavy electrical goods producers continue to be very busy and expect to run at capacity for months ahead.

Defense work still is the backbone of much metalworking production. It is lessening month by month, but can be counted on to sustain schedules at many points well into 1954 and perhaps longer.

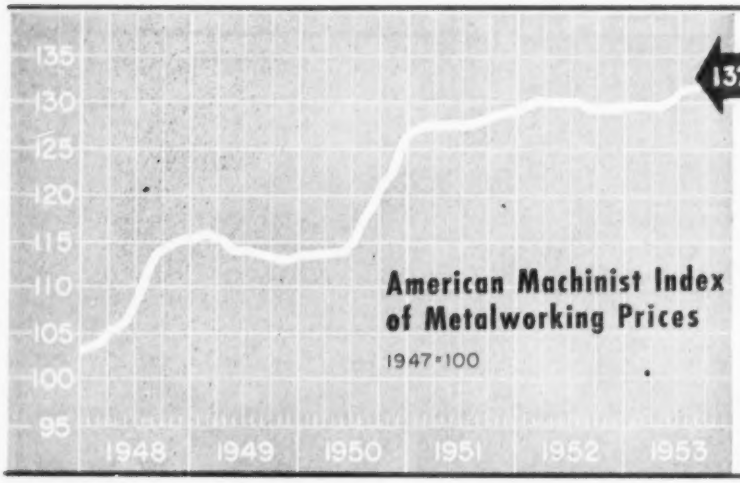
• • •

The tool and die people are doing very well, but are less optimistic about the outlook than they were. When polled recently, almost three out of five viewed the future as "good" but the number who regarded the outlook as "excellent" had dropped considerably from the previous poll.

There has been an increase in the amount of job machining and parts production in tool and die shops. Many shops are working 45-50 hours a week.

Cranes and hoists still are in short supply. Builders will be running at full capacity the next few months. But they are eating into their backlogs and are planning on lower schedules later on.

Gaging Business



132.6 PRICE INDEX

	NOV '53(*)	OCT '53(p)	SEPT '53(r)	OCT '52
Total Index	**132.6**	**132.6**	**132.5**	**129.6**
Metalworking Machinery	**141.7**	**141.8**		**137.9**
Other Machinery exc. Electrical	**137.1**	**137.0**		**132.1**
Electrical Machinery	**131.7**	**131.4**		**123.9**
Fabricated Metal Products	**129.0**	**129.0**		**128.2**

(*) Estimated (p) preliminary (r) revised

Layoffs in manufacturing plants have been rising since the summer months.

The increase in layoffs has been more pronounced in the durable goods industries than in the soft goods industries.

Average hiring rate is lower than it has been for some time.

Industries with low hiring rates today include primary metals, transportation equipment and instrument manufacturing.

• • •

Non-agricultural employment in October showed little change from September.

But November employment is considerably below that for October.

Number of non-farm employees totalled 49.6 million in October—a record high for the month and about a half-million above last year's figure.

Retail trade and state-government employment increased considerably.

But this was offset by a sharp decline in manufacturing employment. But the number of construction workers didn't decline between September and October.

Construction industry employment usually drops sharply in October. But that didn't happen this year.

• • •

October housing starts totalled 88,000 units—about 4000 less units than were started in September.

But this was the first time in six years that public housing starts were reported during October.

Housing starts have topped a million in the first 11 months of this year.

This means that 1953 is maintaining a record of over a million housing starts per year for the last five years.

• • •

Steel output is under 2-million tons weekly for the first time this year. Main reason: softening of demand.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1923-1925 = 100)*	245.9	247.6	250.1
Steel ingot operation (thousands of tons)	1,974	2,044	2,203
Electric power output (million Kilowatt hours)	8,416	8,457	7,971
Production of automobiles and trucks	107,749	115,748	129,224
Engineering construction awards (*Eng. News-Record*—millions)	$145.1	$244.7	$203.0

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Index of industrial production (1935-1939 = 100)*	232	235	228
Index of durable manufactures production (1935-1939 = 100)*	303	309	290
Durable goods manufacturers' sales, millions*	$12,015	$12,615	$11,510
Electrical machinery manufacturers' sales, millions*	1,464	1,467	1,256
Other machinery manufacturers' sales, millions*	1,948	2,014	1,966
Durable goods manufacturers' new orders, millions	9,650	9,541	12,328
Electrical machinery manufacturers' new orders, millions	931	1,116	1,311
General machinery manufacturers' new orders, millions	1,713	1,595	1,883

* Seasonally adjusted

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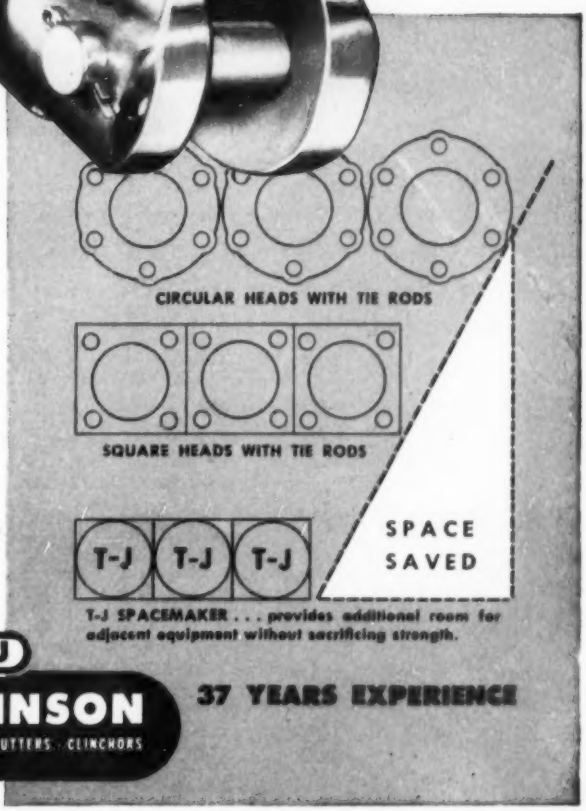
extra high safety factor!

NEW T-J Spacemaker AIR CYLINDERS

These new T-J Cylinders *save up to 40% in mounting space*—with streamlined design that eliminates tie rods. They're *super rugged*—extra high safety factor . . . solid steel heads . . . heavy wall, precision honed, hard chrome plated, seamless steel body . . . leakproof cylinder head to body construction . . . heavy duty, hi-tensile, hard chrome plated piston rod.

Available with the new T-J Super Cushion Flexible Seals which insure positive cushion with automatic valve action for fast return stroke. Many standard sizes and styles . . . for pushing, pulling, lifting, clamping or control jobs. T-J dependability. Write for bulletin 8152. The Tomkins-Johnson Co., Jackson, Mich.



T-J SPACEMAKER . . . provides additional room for adjacent equipment without sacrificing strength.

T-J

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37 YEARS EXPERIENCE

Design and Make your own
AIR GAGING AND MACHINE CONTROLS
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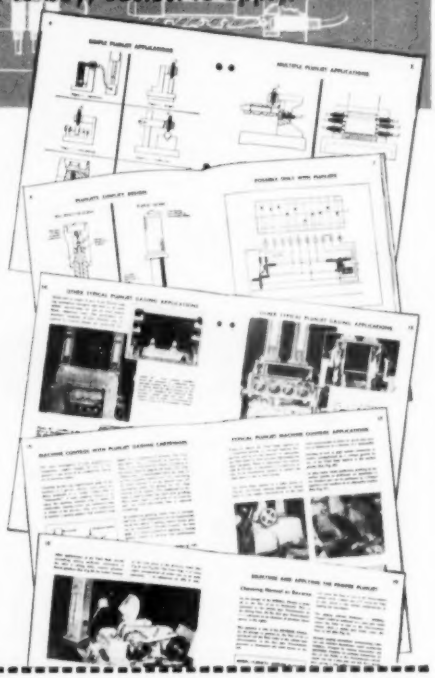

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American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Detroit—Object Lesson

Exciting news is coming out of Detroit. Automobile manufacturers, realizing that soft times are about at an end, are girding for a bitter competitive battle for markets.

Chevrolet and Ford are in the spotlight as the main antagonists. But the fight goes far beyond them. Ford is showing signs, in fact, of challenging all of General Motors.

Chrysler does not intend to be pushed around either. The independents, too, are moving in for the fight. Car makers, in short, are in a mood to battle hard for sales—to sell more cars and to increase their own competitive advantage.

They have been preparing for this day for a long time. They know that they must tempt buyers with a product that is new and much better than the old. More horsepower, easier steering, less work for the driver to do, body lines with plenty of eye appeal.

Note this significant fact. Detroit is not trying to peddle the same old stuff. Compare the passenger car of ten years ago, or even five years ago, with today's. Is it any wonder that with the improvements of 1954, motorists want new cars even if they don't need them?

Automotive men have never been strong for holding onto the old too long. They still remember what happened to the model T.

Nothing is sacred to them. Tradition merely for the sake of tradition has no standing. They are after the business and intend to get it. If customers want more power in their cars, that is what Detroit will give them. If they drool over sports cars made of plastics, that is what Detroit will build.

The automotive industry is just as unconventional in its marketing approach as in its design and production. The big companies nursed their dealers through World War II and have lavished attention on them ever since. Why? Because they realize the truth of the accepted maxim in the industry—the best car in the world cannot be a success unless the manufacturer has adequate and strong distributor outlets.

Automobile men are not chicken-hearted about the outlook for '54. They are much more optimistic than the "experts" who merely play with industry figures and prove statistically that next year can't be good. It is a good guess that the Detroiters will be nearer right than the "experts."

What a lesson for other industries, including the machinery industries! Automobiles, to be sure, are a glamour product. They occupy a special niche all their own. You don't design and sell machinery and other durable products the way you do motor cars.

But the manufacturer of durable goods who cavalierly dismisses the achievements of Detroit as having no application to his business is missing a bet.

Is it too much to expect that if even a little of Detroit's technique and enthusiasm and willingness to try the new were adopted by the durable goods industries, they might increase their sales significantly and help stabilize their operations?

Burnham Finney

72 HOLES

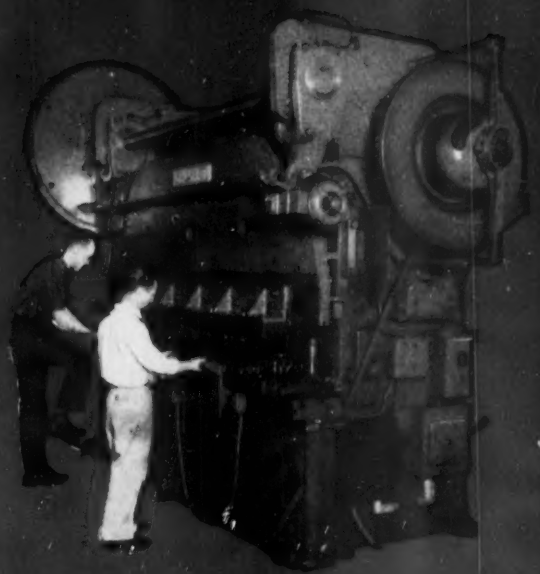
where they belong

Economical assembly depended on maintaining the accurate spacing of these 72 holes and their accurate positioning on this 10-gauge sheet.

This Cincinnati Press Brake is giving a high production at low cost by its speed and accuracy of performance, which insures rapid low cost assembly.

As a press, they offer high production with low investment. As a Press Brake, their low set-up costs, quick change-overs and versatility bring profits.

Write for Catalog B-6 where many examples of the versatility of Cincinnati Press Brakes are illustrated.



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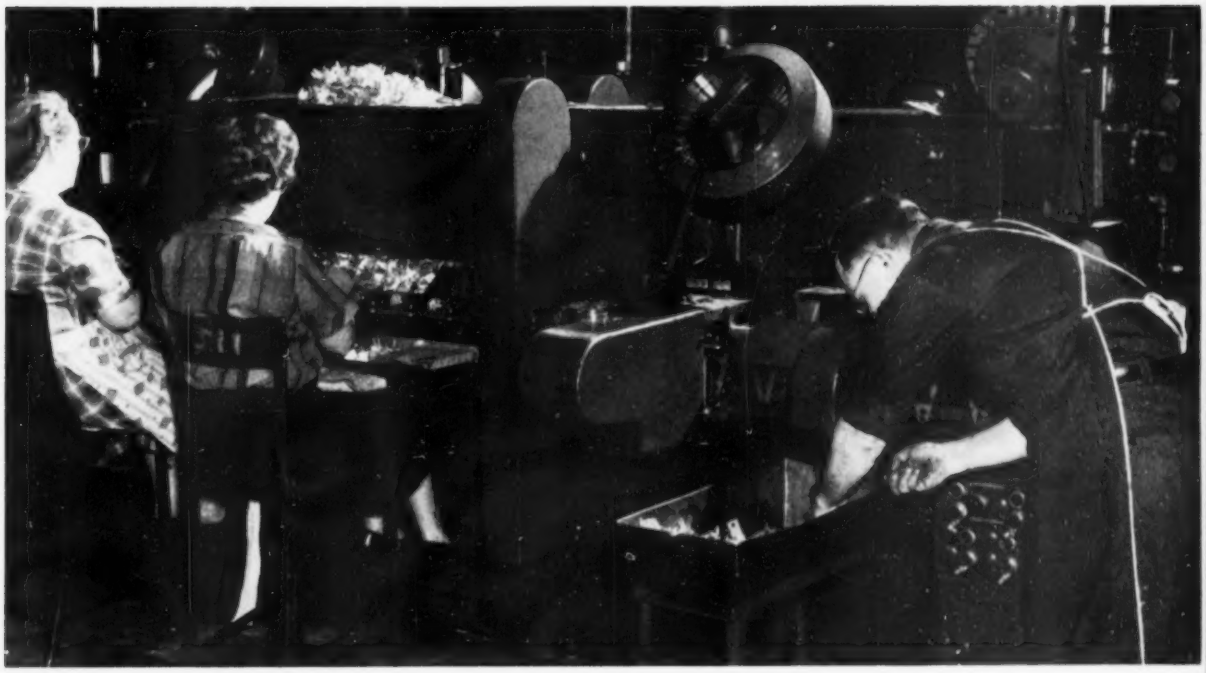
AUTOMATION OF ASSEMBLY . . .



'in-line' assembly machine speeds small-parts manufacture

Standardized machines assemble complicated small products by staking, riveting, brazing, and welding . . .
They mount small drills, boring spindles, welders, presses, milling heads, plus hoppers and inspection devices
They accommodate 6 to 7 operators in comfort and safety although only 12 ft long by 4 ft wide
They aid in product inspection, and they are also arranged to pack the product for shipment

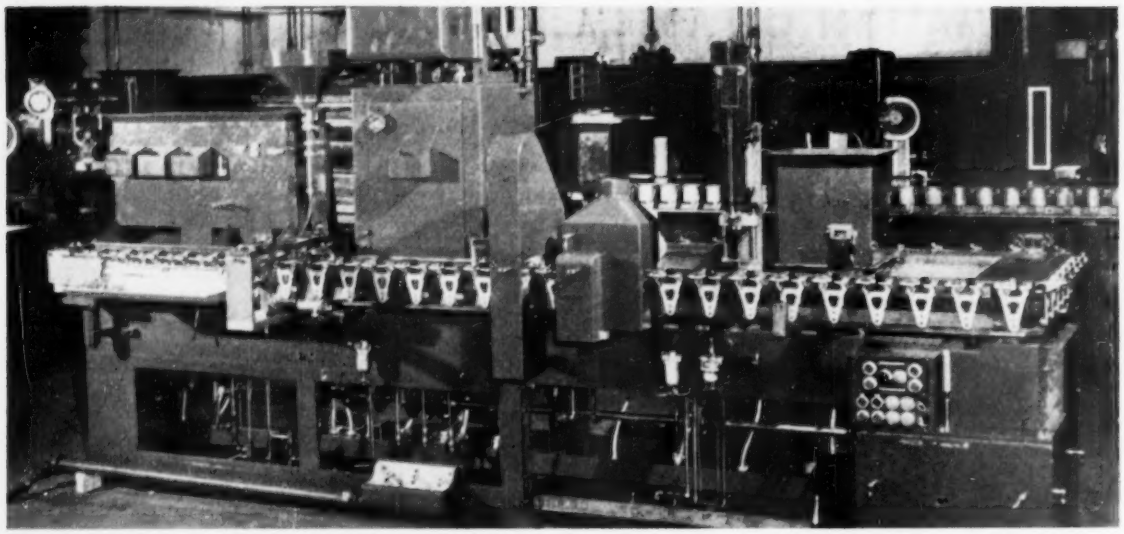
By LORIS H CONRAD,
Special Machinery Engineer
And HILTON J McKEE,
Designer
DELCO-REMY DIV,
GENERAL MOTORS CORPORATION

Design and installation of assembly equipment has been a major problem for many years at the Delco-Remy Div, General Motors Corporation, Anderson, Ind. Small electrical components for automobiles must be produced in large quantities. Quality standards are high. Many materials and assembly processes are required. Costs must remain competitive, and be reduced if possible.

Parallel problems exist in the packing of these products for shipment. Sometimes, both assembly and packaging operations can be combined for maximum efficiency.

We have now applied the automation principle to both assembly and packaging work. Instead of conveyors, from which people pick a partially completed item, add something to it, perform an operation, and then return the piece to a conveyor, we now have a standardized machine.

By "standardized," we mean that the machine's power train, its method of transporting the work, and its size are standard for the score or more machines that we build yearly. But we have complete freedom in how we set up operations on the perimeter of the 12 ft long by 4 ft top of the machine, which stands 30 in. from the floor. In any desired arrangement, we can place work hoppers, boring spindles, drillpresses, milling heads, welders, induction



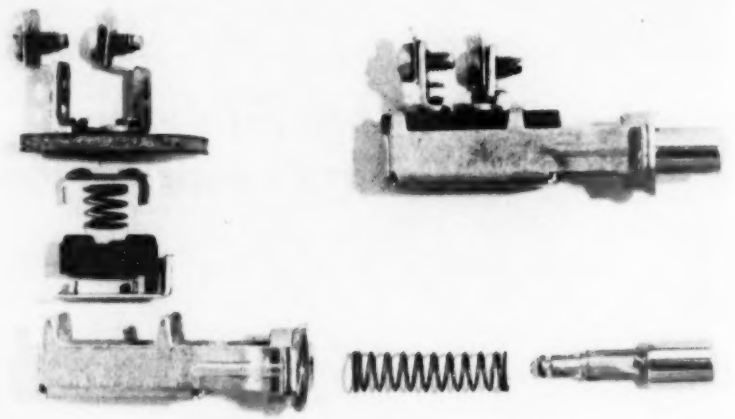
MULTI-OPERATION ASSEMBLY . . . Machine is built up to assemble the high-speed lever arm for a distributor. Operations performed are: (1) ream a hole, (2) mill a contour on the Bakelite rubbing block, (3) hot upset the rivet that holds the rubbing block and spring, (4) feed a bushing, (5) stake a bushing in the lever, (6) burn off the fuz on rubbing block; using gas flame, and (7) inspect

heaters, tapping heads, screwdriving heads, riveting and staking presses, special loaders and unloaders for fixtures, box-sealing equipment, stenciling machines, numbering stamps, or any other type of device or machine that is needed and can be fitted into the available space.

TRICKS FOR TIGHT CORNERS

Sometimes, considerable ingenuity is required to get the required machine motions into limited space. In one case, we needed a seaming machine but the base was too large. So we discarded the base, and mounted the head and operating mechanism on a special casting that put the operating zone of the machine at the right height. In another instance, we needed a reciprocating motion to move a cutter, so we took a bench shaper, put on a motor for the cutter-spindle drive, and fastened the whole to the assembly-machine table. Adaptations of this kind are frequent, because machine manufacturers either make equipment too large for our purposes, or it just is not available in the desired combinations of motions and capacity.

We have another way of getting around the problem of how to use a big piece of equipment. We make up the machine in a wide-track design and a narrow-track model.



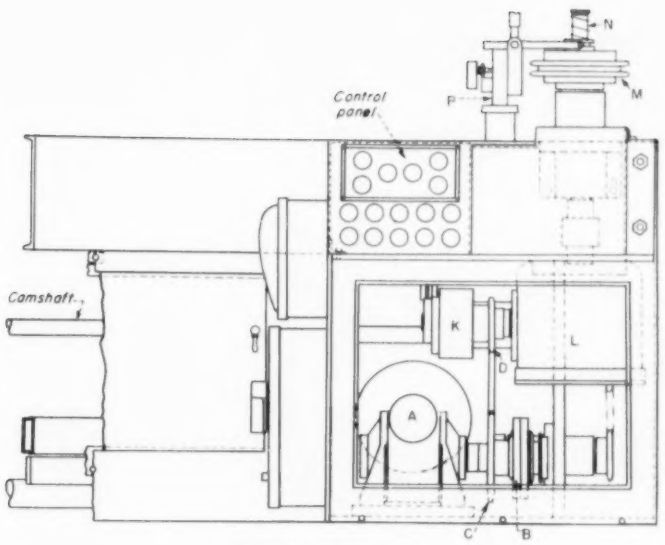
THIS STARTER SWITCH is typical of more difficult assemblies produced by in-line assembly machines

The first allows us to have 6 or 7 operating stations; the second reduces the number of stations but does allow us to install a large piece of equipment and even to provide supporting legs, as for a large welder.

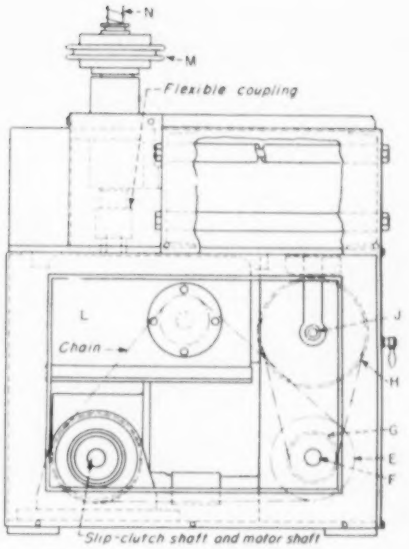
OPERATING PRINCIPLE

The principle of our assembly machine is this: Standardized fixture brackets are attached to a double-strand roller chain that runs around the top of the table. These brackets move 5 in. per index (as standard), but sometimes a 3¾-in. or an 7½-in. movement better suits our needs. Each bracket has a bearing at bottom to bear against a hardened track on the table top, and two anti-friction bearings on the underside of the top face to bear against another hardened track. This arrangement guides the brackets and supports them, so that the chain merely has to transport them.

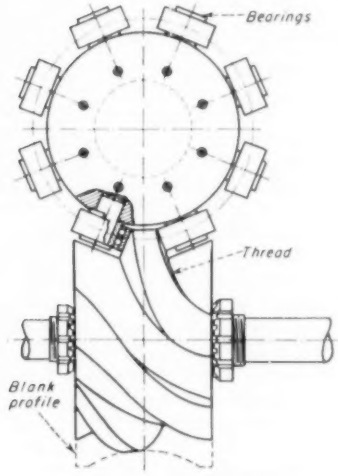
At operating stations where a considerable amount of pressure may be applied to the work, the fixture bracket is picked up by some kind of supporting means. For example, a pilot with a ball-bearing nose may be thrust into



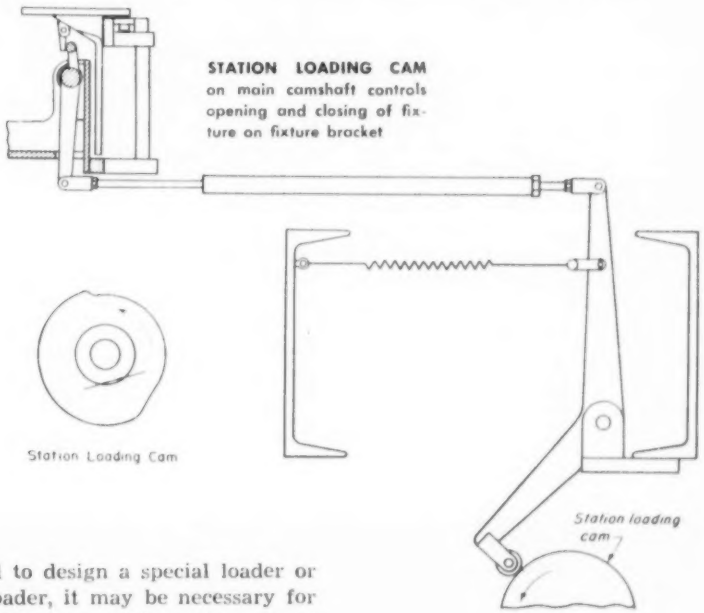
Front view at drive end



End view at drive end



Ferguson roller gear drive



STATION LOADING CAM on main camshaft controls opening and closing of fixture on fixture bracket

a recess in the bracket by means of an air cylinder.

Work-locator pads are affixed to the brackets. Usually, the nest allows the piece to float in the direction of chain travel, about 1/32 in. each side of center, so as to compensate for any variation in indexing.

The supporting surface of the fixture bracket is made of sufficient size to suit fixture or locators. Sometimes, two-position fixtures are applied. The front fixture nest is made large enough to provide float; the rear fixture is carried on a subplate with the required 1/32-in. float.

Where it appears to be impractical to design a special loader or unloader, it may be necessary for the operator to take a piece out of the fixture bracket rest and do an operation manually. Or she may adjust the part in the fixture, manually add a piece, or perform an inspection operation. The machine is provided with comfortable foot rests and stools. In short, the machine is not completely automatic, but functions automatically as far as is practical. And considering the number of indexes a minute, the number of operations and their complexity, we have a high-producing piece of equipment in a relatively small amount of floorspace.

Full safety features are built into the machine. The master control panel and throw-out switch are at the right end of the machine, the position of the chief inspector or leadman. At each operating station, there is a safety switch, which stops the chain index if a jam occurs or the operator is having difficulty. At the most critical operation, usually power screw driving, the utility man has a three-position switch—stop index, machine off, and on index. If an operator pushes a stop button, the man in charge checks through and remedies the

IN-LINE ASSEMBLY MACHINES have been adapted to packing shipping containers with proper parts, performing light operations in some cases, and making the container ready for shipment

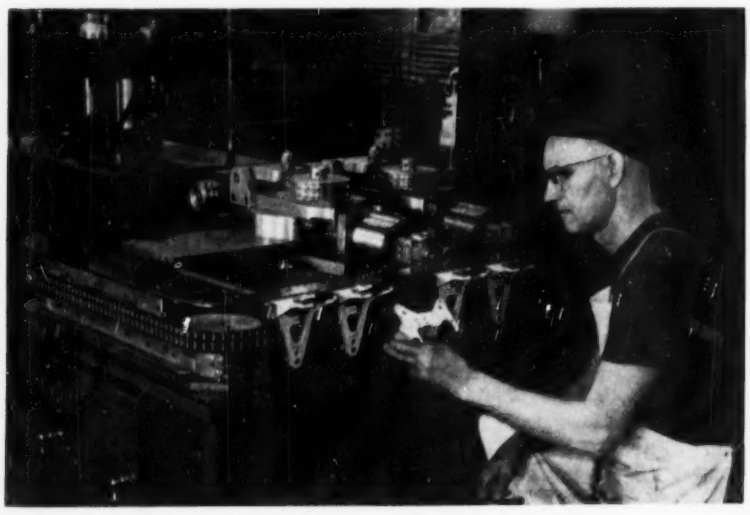
trouble, then has to start up the machine at the master panel. His trouble-shooting is aided by a system of colored lights on the panel.

Running lengthwise of the machine in the base there are: a square power duct, and an air line supplying filtered, lubricated air to the numerous cylinders which actuate devices at the operating stations.

The things that can be done with the machine are limited only by the designer's ingenuity and cost considerations. We are using a large number of these in-line assembly machines, and while the basic principle is the same in all, we do find ways of adding gadgets. These often save an operation elsewhere in the parts-manufacturing areas of Delco plants or improve the quality of the assembly.

OPERATION OF MACHINE

A ½-hp Jannette speed reducer *A* with an output speed of 36 or 45 rpm powers the two main elements of the machine: (1) the continuously running work-station camshaft and (2) the intermittently operating Ferguson roller gear drive for indexing the fixture chain. The camshaft controls indexing.



DELCO-REMY builds a number of in-line machines each year in a special-machine building area

Power flows from the speed reducer *A* to a Hilliard slip clutch *B* and thence to sprocket *C*. The drive chain passes over sprockets *C*, *D* and *E* (end view), the last one being on a jackshaft *F*. A second sprocket *G* on the jackshaft drives the sprocket *H* on the work-station camshaft *J*.

When the camshaft has made a complete revolution, a master cam affixed to it trips the Hilliard one-turn clutch *K*. Power now is connected to the Ferguson roller gear drive, which is designed to impart a "modified trapezoid" acceleration as it indexes the chain in 0.8 to 0.9 sec.

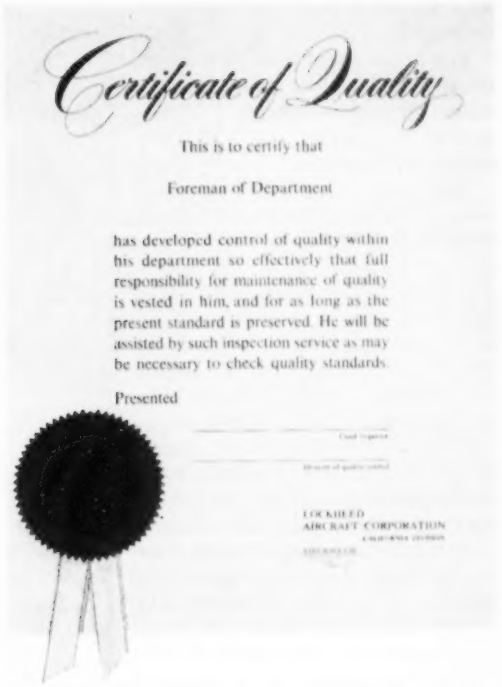
The roller gear drive is connected through flexible coupling to a drive sprocket *M*, which drives the ⅝-in. pitch, double-strand fixture chain during indexing. If anything catches in the mechanism anywhere, and no safety switch is thrown, the Hilliard slip clutch *B* slips and neither the camshaft will turn nor the fixture chain move. The utility man then stops the motor and manually throws out clutch *N*, releasing drive sprocket *M* from the drive shaft, and operating switch *P*, which prevents the motor from being started until clutch *N* is returned to normal position.

The work-station camshaft may have 20 or more carefully timed cams, with sometimes two or three cams per station for controlling equipment there. About one-third of the periphery of these cams is blank to avoid interference while master cam is causing the Ferguson gear to operate.

Reduced inspection improves quality

Rework is substantially reduced, and inspection costs lowered by a new production-inspection system installed at Lockheed Aircraft

By GEORGE H PRUDDEN, Director of Quality Control
LOCKHEED AIRCRAFT CORP, BURBANK, CALIF


Certificate of Quality
This is to certify that
Foreman of Department
has developed control of quality within his department so effectively that full responsibility for maintenance of quality is vested in him, and for as long as the present standard is preserved. He will be assisted by such inspection service as may be necessary to check quality standards.
Presented
LOCKHEED
AIRCRAFT CORPORATION

CERTIFICATE OF QUALITY may be awarded to any department found capable of maintaining its own quality standard and requiring only minimum inspection. It may be revoked if standards drop

Lockheed's new inspection system was derived from the Air Force's "surveillance" inspection of our T-33 trainer. In 1950, the Air Force discontinued detailed inspection of each plane by its own inspectors. Responsibility for inspection was left up to Lockheed; Air Force inspectors made only spotchecks to make certain we were doing the job.

We felt that the innovation turned out well. It reduced requirements in Air Force personnel. But more than that, it put our inspectors on their mettle, and it gave their morale a boost by indicating Air Force confidence.

We reasoned that even more positive results could be obtained by putting production departments on their mettle. It's a firm tenet of Lockheed Quality control that quality must be built in—it can't be inspected in. As we see it, the goal of an inspection department is to reduce its work to zero. Anything that would stimulate production departments toward more effective policing of their own work quality would be a step in the right direction.

So Quality Control proposed that, in those departments which proved themselves ready for such a step, detailed inspection at all stages of assembly would be eliminated, and replaced by one complete shakedown of the assembly just before it left the department. Only interim checkpoints would be at those stages where a part would be covered up so it could not be adequately checked at the main inspection point.

Thus Production, not Inspection, would be responsible for quality work reaching the end of the line. There would be no "Let Inspection catch it," or "Well—Inspection passed it."

Management accepted the plan enthusiastically, and results to date have fully justified the enthusiasm.

Reduced inspection was made an honor. For it to be put into effect, production departments must meet specific standards and receive a "Certificate of Quality." Award of the certificate is based on quality of workmanship, housekeeping, attitude of workers and supervision. Squawks (minor variations that can be reworked) and rejections must be reduced to a prescribed minimum.

The certificate is revocable any time the department falls below any of the standards set. At least 95% of rejections must be reported by the department rather than discovered by Inspection, and those discovered by Inspection must not be of a type that should have been reported by Production.

The new system was first put into effect in the department which assembles T-33 fuselage side sections. In the type of work done, an average department in a plant with average quality control could have 50-60 squawks per ship and 10-12 rejections without being considered out of line. When Dept. 16-48 received the Certificate of Quality, it had already reduced squawks and rejections to a total of 12. By the third month of reduced inspection, it had improved on this excellent record by averaging only

4.03 squawks per ship and 2.44 rejections.

The department used to have 44 points of inspection. It now has one major inspection station — at the end of its assembly job—and five minor checkpoints.

Here's an example of results obtained: An inspector used to check each skin panel for scratches before it was installed. Now it's up to Production to make sure that scratched panels are not used. If, at a later checkpoint, a scratched panel is discovered by an inspector, the scratch is charged to the department as occuring in production.

Without the "Inspection passed it" excuse, scratched panels have been reduced to virtually zero from an average of 10% of the total.

Only two other departments have so far been put on reduced inspection (in one of them 111 inspection points were cut down to eight), but the effect of the system has been felt throughout the plant.

The savings in inspection manhours — about 80 hr per week — have been significant, but they are negligible compared to the savings in rework time and materials. If Inspection catches a blunder, it can prevent a faulty product leaving the plant, but at the cost of rework. If Production catches a plunder—or doesn't make it—rework is eliminated.

Such savings are hard to pinpoint as to source, but it has been apparent that quality of workmanship has taken a sharp upturn. Dept. 16-48 had long had an outstanding record, yet in the first 5 months of reduced inspection, its production costs dropped 15% more than departments not certificated.

Competition has become keen among departments for achieving Certificates of Quality. Very important, foremen have seen what can be done by self-policing to cut their costs.

We are watching the program carefully and expanding it slowly. It will take steady work on the part of Quality Control to keep inspection departments on their toes. But from the results of the first few months, it seems likely that reduced inspection will soon be extended greatly.

Reclaimed oil boosts thread-grinder output

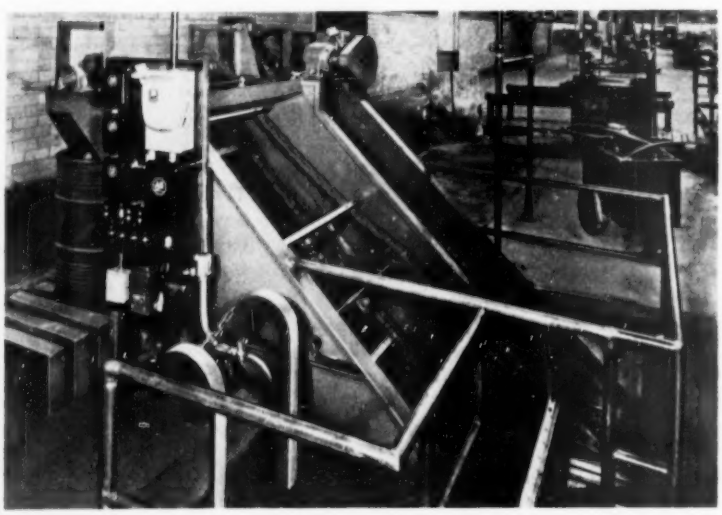
Filtration of thread-grinding oil produces better finish, increases production, reduces wheel dressing, doubles wheel life, and effects major savings in oil cost

By C I WALLACE, Mgr, Industrial Filtration Div,
UNITED STATES HOFFMAN MACH'Y CORP, SYRACUSE, N Y

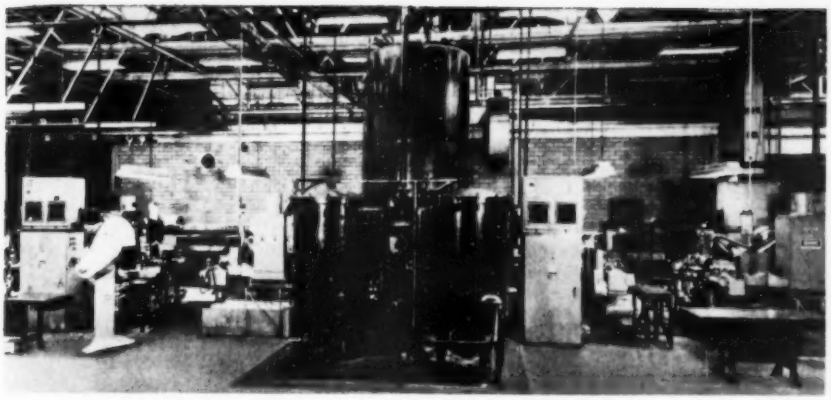
In laying out a new department for the production of electric windshield wipers, Electric Auto-Lite Co found it advisable to install a complete filtration system for its grinder coolant. The grinders thread armature shafts of wiper motors.

Soon after the new department commenced operations, it was found that the oil temperature was rising above a safe level. A study made by engineers of US Hoffmann Machinery Corp revealed that a clean-oil reservoir should be added as a cooling pool.

It was necessary to disconnect the filtration system for six weeks while the new reservoir was installed. This provided an ideal opportunity for comparing grinding operations with and without filtration. Need for clean grinding oil at a controlled temperature immediately become apparent. Excessively hot oil caused a burr on the armature shafts. This acted as a broach when the shaft was assembled with the bearing, and caused a loose fit. The result was noisy operation and a high percentage of rejects. In addition, the



DISCHARGE END of scraper flight conveyor which carries sludge from bottom of separator and dumps it into disposal cart



THREAD GRINDING DEP'T at Auto-Lite shows two J & L thread grinders. Upright units with black squares are monitors for automatic control of grinder operations. High tank, center, is oil-cooling reservoir, two smaller tanks are Hoffman pressure filters. Magnaflo separator is below floor

contaminated oil made it impossible to bring the finish up to specifications, and rejects were further increased. In an effort to improve the finish, grinding wheels had to be dressed more frequently and production was slowed again. Unfiltered oil thus shortened grinding - wheel life by 50%.

After every 40 hr of operation, 440 gal. of oil had to be replaced at a cost of $206.80. Machine sumps had to be drained and cleaned, and new oil added, once a week. This job had to be done on Saturdays, at double time, by two men working eight hours each.

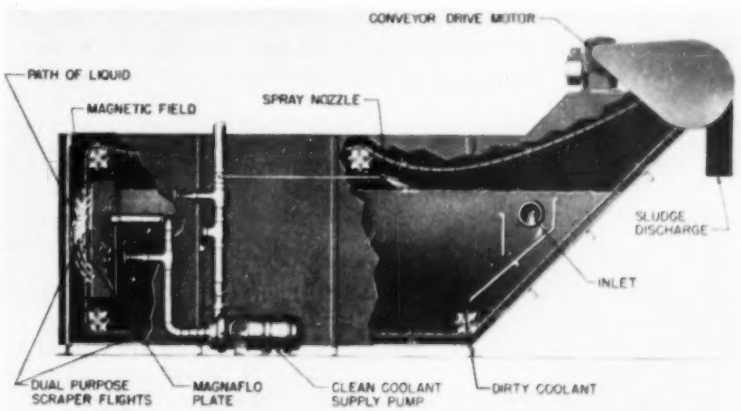
After the oil reservoir was installed, increasing the system capacity, the filtering equipment was reconnected. Production problems disappeared immediately and output soared. A survey of the advantages of filtration indicates that rejects are held to a minimum; quality of work is improved; $206 are saved weekly because no oil is discarded; 16 hr of Saturday double time for cleaning is saved; wheel life is doubled; wheel dressing is reduced 50%; production is increased 30%, and over-all operation has improved 75%. In addition, 2640 gal of oil contaminated during the six-week period were fed back into the Magnaflo separator to be cleaned, saving $1140.80.

The filtration system consists of two Hoffman model 1-80-S pressure filters with a flow rate of 140 gpm each, one Hoffman Magnaflo model 60 with a magnetic-type filter and flow rate of 100 gpm, and one 2000-gal oil reservoir. It is designed to serve four Jones & Lamson thread grinders. The 4780-gal capacity is a little larger than needed at present, but provides a reserve for two more J & L grinders to be added in the future.

Dirty oil from the grinders flows by gravity to the first section of the Magnaflo tank. Detention time there is 10 min to allow larger metal particles to settle out. It is then pumped through a magnetic field at the other end of the tank to remove all remaining ferrous material. A dual-purpose conveyor removes the sludge from the bottom of the tank and also scrapes the magnet clean.

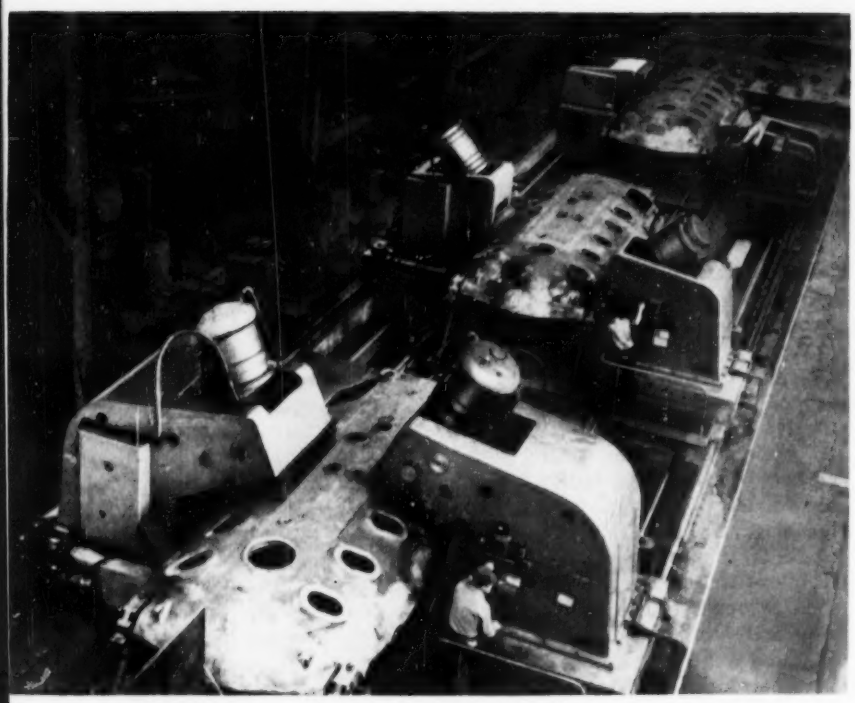
One of the reasons the oil used by Auto-Lite becomes so heavily contaminated is its high viscosity, 300 SSU, which tends to pick up and hold all impurities in suspension. This creates a need for more thorough filtering than can be accomplished by the Magnaflo separator alone. Clear oil obtained by pumping it through the two pressure filters equipped with fine-mesh screens precoated with filter-aid powder.

Only one pressure filter is in use at a time. The other is valved into the system to insure continuous operation when the pressure on the first filter has risen to a point which indicates cleaning and recoating the screens is necessary. Screens to be recoated are scraped down by an externally operated device which is part of the filter. Spent precoat powder and impurities removed from the screens drop into the bottom of the filter tank and are removed through a clean-out door. Placement of the pressure filters is such that sludge removed from them and the Magnaflo unit falls into the same disposal cart.



SEPARATOR UNIT removes large ferrous particles by gravity, finer particles by drawing through a magnetic screen

TRAVELING-HEAD GRINDERS FINISH



THESE SIX MERCURY traveling-head grinders finish three sets of pads on each side of the M-48 tank hull. Overhead cranes transfer hulls from fixture to fixture. Rails along which heads are traversed are carefully leveled so pads can be finished within required tolerances. Photo courtesy Continental Foundry & Machine Co

When you're machining armor plate, grinding may be cheaper than milling; and when the work is as big as a tank, it's easier to reciprocate the machine than the work

By JOHN HORTH, Chief Engineer, MERCURY ENG'RG CORP
and C E STEVENS, General Mgr, BENGSTON, INC

"IF YOU can't cut, grind it" has long been one of the first axioms learned by tool and production engineers. It is well worth remembering when it is necessary to finish surfaces on hard armor steel castings, or on weldments where machining is difficult because of hardness variations caused by cutting and welding.

But size limitations have, until recently, ruled out the use of grinding for finishing surfaces on large parts. While large planer-type millers have been used for years, capacities of reciprocating-table face grinders have been somewhat limited. Even planer-type millers seldom have capacity for operations on parts as large as the 22-ft long, 8-ft high and 10-ft wide M-48 tank hulls.

The 15-ton hulls are welded assemblies of formed and cast armor steel components. They are so difficult to machine that face milling of pads and openings along the bottom and side surfaces is a succession of dulled and broken cutters, coupled with a constant battle to maintain satisfactory finishes.

These bottleneck operations have now been transferred to travelling-head face grinders in two tank plants. The machines have the important advantage that the length of work that can be traversed is virtually unlimited. By increasing the length of the foundation and ways, traversing range can be increased to any desired capacity.

The grinders now in use move on a 100-ft long foundation and remove approx 1000 lb of stock in a cycle time of only 1½ to 2 hr. Roughing and finishing are performed by the same machine. A surface grinder is usually considered as a finishing machine but, in these cases, cost considerations dictated the use of grinders from start to finish.

The first plant to install traveling-head grinders for tank hull operations studied the application carefully before approving it. It had finished more than 3000 hulls for another tank of similar size and type by milling, so data were available for an accurate comparison.

The hull-machining operations were studied from the standpoint of net over-all cost, with consideration being given to such factors as cost of machine, cost of fixtures, cutter or wheel cost, and labor cost.

Metal-removal rate when surface grinding mild steel is approx 0.1 cu in. per min per hp; for face milling it is approx 0.5 cu in. per min per hp. An increase in hardness to armor-plate levels can be expected to reduce grinding rate approx 20%, milling rate approx 50%. The value for milling is not fully predictable, as experience has shown that, on some jobs, much time may be spent in replacing dulled cutters, and speeds and feeds may have to be reduced to prolong tool life.

The weight of the tank hull is sufficient to hold it down during grinding, so fixtures need only sup-

HEAVY WORK

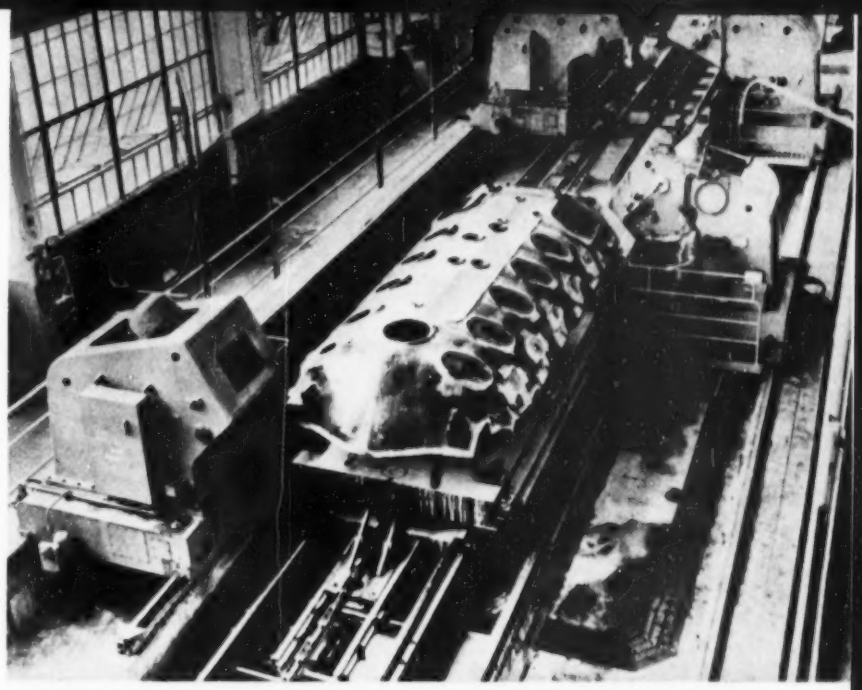
port and locate it at the several stations. There is no need to provide heavy clamping devices, as are necessary when heavy face milling cuts are taken. Furthermore, no difficulty is experienced when grinding both sides of the hull simultaneously with two different traveling-head grinders. On the other hand, heavy vibrations that seriously affect finish are often set up when attempting to mill both sides at the same time.

Cost of grinding wheels is considerably lower than cost of milling cutters for these operations. Approx 660 cu in. of metal must be removed when roughing and finishing the 25° torsion bar pads along one side. One 30-in.-OD segmented wheel, costing approx $39.00, will rough and finish an average of 11 hull sides, for an average wheel cost of $3.54 per side, or $7.08 per hull. When milling these pads, average life between grinds of the face mill is one-half a hull side.

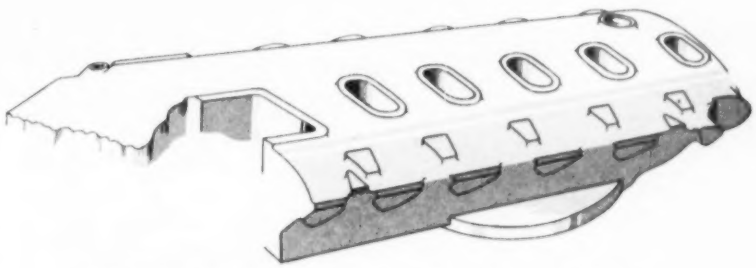
When roughing and finishing the upper 45° bogey wheel pads along one side, approx 330 cu in. of metal must be removed. Average life of the 20-in.-OD segmented grinding wheel is 3½ hull sides, for a grinding wheel cost of $20 per hull. The shorter wheel life on this operation is caused by the necessity for feeding the wheel down directly into the work before starting a traversing pass.

Approx 330 cu in. of metal are removed when roughing and finishing the lower 45° pads along one side and average life of the 24-in.-OD solid cup wheel is 27 hull sides. The solid wheel is more expensive than segmented wheels, but for this operation grinding wheel cost is only $6.82 per hull.

Totaling these costs gives an average grinding wheel cost of $33.90 per hull for removing approx 2640 cu in. of welded and gas-cut hard armor steel. Over-all milling cutter costs on the older type of tank hull exceeded this total by more than $50. Direct labor cost for grinding averaged 67% of that for milling.



IN THIS SETUP, torsion bar pads and upper bogie wheel pads along each side of the M-48 welded armor steel hull are finished by grinding, after the pads have been rough milled and welded. Fixtures are pulled along rails to move hulls from station to station. Photo courtesy Fisher Body Div, General Motors Corp



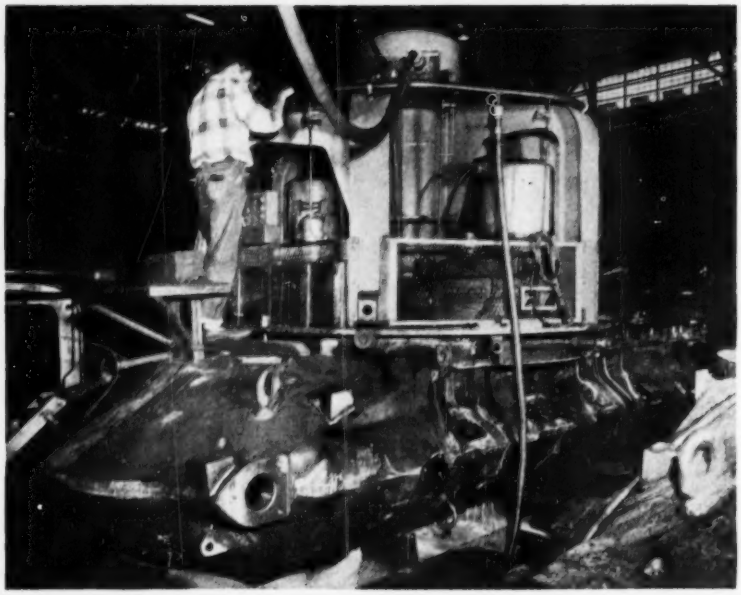
THREE ROWS OF PADS along each side of the M-48 tank hull must be finished to close tolerances for face location and surface finish. Grinding of these pads has been found cheaper than face milling

In one of the installations studied, the final finish was produced by milling. In this case, however, the finish cuts were at a metal removal rate no greater than that obtained when finish grinding. When grinding is used, the final finish obtained is approx 80 mu in. rms.

Three pairs of traveling-head grinders are employed for rough and finish grinding the three sets of pads along each side of the hulls at Continental Foundry & Machine Co's plant. Three locating fixtures are placed in line between the rails, and the hulls are moved from fixture to fixture by overhead crane. One set of pads along both sides of the hull is machined at each station.

Each head weighs 13,700 lb and is supported on rollers. The heads move at 30 fpm, reciprocating automatically between adjustable limit switches until a set of pads is finished, or until the down feed bottoms against a stop, indicating that the grinding wheel is used up. When this happens, the operator traverses the head off the workpiece and replaces the wheel.

At the end of each stroke, the spindle automatically feeds down a present amount. In the setup shown, downfeed is 0.008 in. at the end of the hull where the wheel runs off the work and 0.003 at the other end, where an obstruction on the hull prevents running the wheel



LARGE "PORTABLE" two-head grinder rough and finish bores and faces 8-ft dia turret bearing seats in the M-48 tank hulls made at Continental Foundry & Machine Co's plant. Machine is moved by crane Photo courtesy Continental Foundry & Machine Co

TRAVELING-HEAD GRINDERS

continued

off the work and it must be plunge-fed into the work before starting the return traverse.

Wheel spindles on each of the six heads are powered with 75-hp motors, and spindle drive rotates the wheel at 5500 sfpm. Coolant is picked up from a trough between the support ways by a suction pump, and fed through the wheel spindle.

At the tank plant operated by Fisher Body Div, General Motors Corp, hull pads are rough machined on planer-type milling machines, using inserted-blade face-milling cutters. Then any defects in the cast pads are repaired by arc welding, and the hulls are transferred to a four-head grinder. Here, two sets of pads along each side are finished to close tolerances, one set of pads being ground with each head. The hulls are supported on wheeled fixtures that are moved between the two grinding stations by a heavy drag chain.

At Continental Foundry & Machine Co a large "portable" two-wheel grinder machines the turret ring bearing bore and seat in the M-48 hull. Grinding was the logical approach to this operation, both because the degree of accuracy required is most easily achieved by grinding, and because the out-of-round condition of the bore caused by welding and heat-treating operations makes boring by conventional means somewhat difficult. In addition, there is a thin-wall section on one side of the bore that tends to spring away from a boring tool bit, with resultant chatter and distortion. Grinding permits holding the bore within the required 0.0025-in. tolerance without difficulty, and surface finish is well within the allowed limits.

The turret ring bearing boring and seat finish operation is performed while the hull is mounted on floor blocks, or on a transfer car. The grinder is lifted by overhead crane and set on ridge around the turret ring. The operator guides it into approximate location, then swings locating gages into position and adjusts jackscrews to move it into exact position.

When the grinder has been positioned, the two grinding wheels are adjusted manually until both wheels spark. Then, the machine is set for automatic cycling. Infeed for bore grinding and down feed for the seat grinding are not automatic, because of the problems imposed by distortion of the hull assembly. The operator controls these feeds with pushbuttons. Both spindles are driven with 20-hp motors. A 20-in. OD 32A46-H-12-VBEP Norton cup wheel is used for the seat facing operation and a 20-in. OD 32A54-I-12-VBEP Norton cylindrical wheel for the bore. Wheel cost is slightly less than $2.00 per hull.

Bore diameter is approx 8 ft, face width is 1½ in. and complete cycle time, floor-to-floor, is approx 150 min. Approx 0.125 in. stock must be removed from the bore, and approx 0.062 in. from the seat face. Usually the bore is 0.060 to 0.090 in out of round before bore grinding starts.

Where projections may interfere with traversing of the heads, as when grinding the pads along the sides of the M-48 hulls, a bridge-type, double-head grinder can be used. This machine can be located with the spindle axis directly over the centerline of pad openings on opposite sides of a hull, and held in that position with pins in a bar alongside the traversing ways. The two spindles then reciprocate up and back, clearing the work on both sides while facing a pair of pads. Spindle feed at the end of each stroke is automatic.

ELECTRICAL INTERLOCK

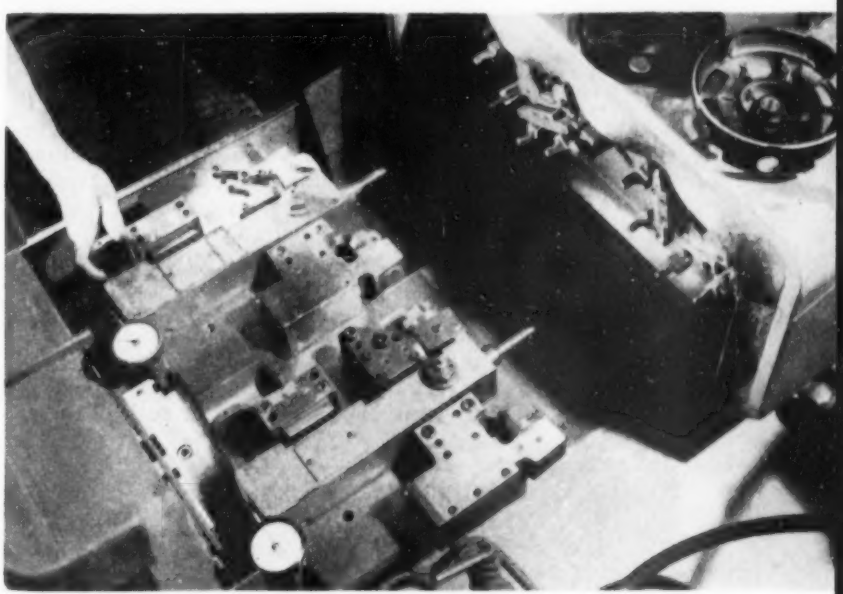
Reciprocating motion of the grinding heads on the bridge-type grinder is electrically interlocked so the two heads move up and down simultaneously, and at the same traversing rates, to eliminate side sway or vibration caused by unopposed inertia forces. This bridge-type grinder can, of course, be designed with wheel-head traversing ways at any required angle, and so can be adapted to many different operations. One such machine is being constructed for finishing a welded diesel locomotive block where the combination of press-formed and cast components joined with weld metal of varying hardness poses difficult metalcutting problems when the weldment is to be machined by conventional methods.

Two operations complete intricate aluminum die-castings

Novel tooling, designed around a precision boring machine, utilizes special cutters plus a counterbalanced chuck to bore, turn, and face one complicated die-casting every 10 sec

BY HERBERT P KUNKLEMAN,
Tool Engineer
Small Motor Division
WESTINGHOUSE ELECTRIC CORP
Lima, Ohio

SPECIAL FOUR-FACED CARBIDE TOOLS minimize tool replacement and adjustment time on this two-spindle precision boring machine tooled for boring, turning, and facing die-cast aluminum motor brackets. Centrifugal dampeners minimize vibration and chatter

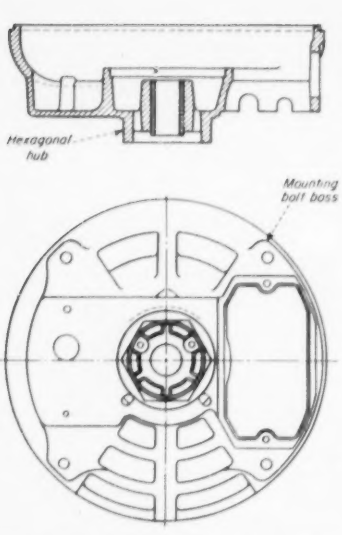


TOOL BLOCKS WERE DEVELOPED to support the four-faced carbide turning, facing, and chamfering tools used to machine intricate die castings. Workpieces turn at 2800 rpm while cuts are taken

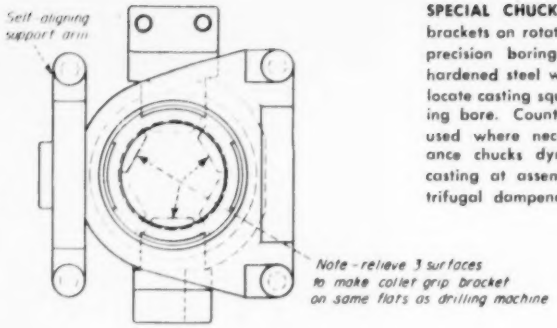
Improved machining setups were made possible when we replaced cast-iron brackets (end bells) with die-cast aluminum alloy brackets on most fractional-horsepower motors. Where five machining operations were needed to finish the CI brackets, die-cast brackets, require only two. In addition, tool life has been materially increased.

A conventional four-station Kingsbury indexing machine drills the oil hole and the conduit-box hole, reams the bearing hole, and presses in place the steel-backed babbitt bearing, when set up for standard die-cast front brackets. The conduit box hole is eliminated when this machine is tooled for rear brackets.

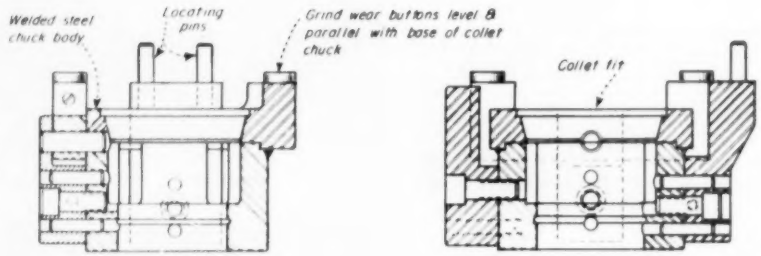
Novel tooling makes it possible to perform all other machining in a standard two-head, single-end Heald precision boring machine. Working on two brackets at a time, this machine bores the babbitt-lined bearings to within 0.0003-in. tolerance on the bore dia. Then it rough and finish turns, and faces and chamfers the rabbet-fits



DIE-CAST FRONT BRACKET for fractional-horsepower electric motor has hexagonal hub and four flat mounting bolt bosses which are used to locate and hold the bracket in both machining setups. Rear brackets are of like design



SPECIAL CHUCKS for holding brackets on rotating spindles of precision boring machine use hardened steel wear buttons to locate casting square with bearing bore. Counterbalances are used where necessary to balance chucks dynamically with casting at assembly with centrifugal dampeners

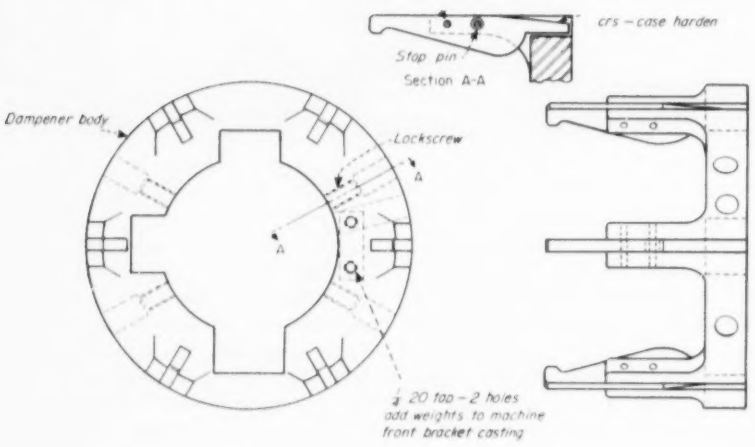


around the periphery of the castings to within 0.002-in. tolerance on the fit dia, while holding this fit concentric with the bore within 0.003-in. total indicator reading.

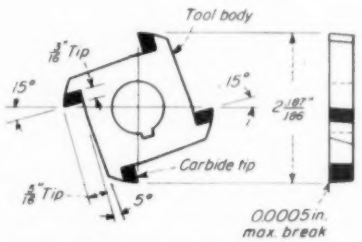
Locating, and holding, points on the die-cast brackets are the same for both machines. Gripping is done on three alternate faces of the hexagonal bracket hub, and the rabbet face is held square with the bearing bore by locating against the four mounting bolt bosses on the outside face of the bracket. In both setups, spacers are used behind location-point wear buttons to adjust for different brackets within the same diameter range.

Special air - operated collet chucks, each with a self-aligning support arm for two of the four location-point wear buttons, are used to hold and rotate the brackets in the Heald machine. To prevent resonant vibration of the bell-shaped brackets during boring, and facing cuts, centrifugally-actuated vibration dampeners contact the outside surfaces of the castings as soon as they approach full speed of 2800 rpm. These six-arm dampeners are mounted around and rotate with the chucks.

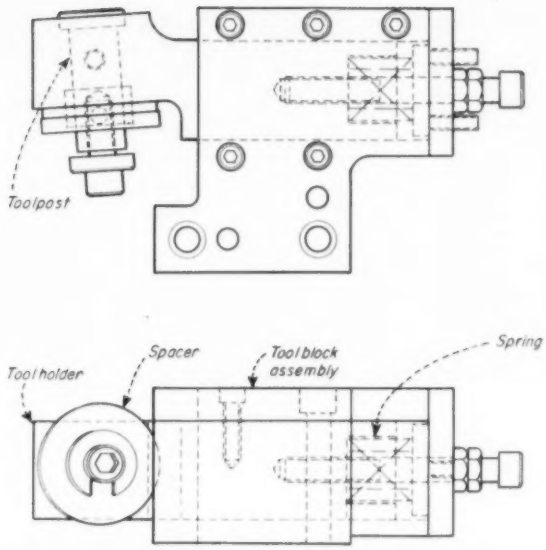
As the tool table of the boring machine moves forward under power feed, the two-bearing boring bits fully traverse the 1¼-in.-long bearings before the other tools start to cut. These carbide bits are



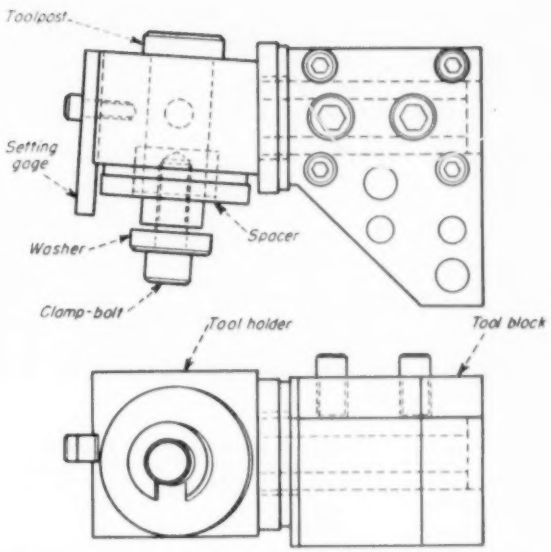
SIX CYANIDE-HARDENED CRS ARMS, centrifugally-actuated, contact the OD of the workpiece when precision boring machine spindle nears 2800-rpm operating speed; thus minimize resonant vibration of the bell-shaped part. This reduces chatter during cutting cycle



FOUR-FACED TURNING AND FACING TOOLS for machining rabbet fits on die-cast brackets are supported on 0.750-in. dia posts set in rough and finish toolblocks. Tools are positioned with setting gages



ROUGHING TOOL BLOCK for turning and facing rabbet fit on die-cast motor bracket has spring-loaded holder that moves into block when it strikes stop-button at end of cut. Tool post is held at 4° with normal axis of cutter to provide clearance for tool edge



FINISHING TOOL BLOCK holds four-faced tool rigidly while turning and facing approx 0.003 to 0.005-in. stock from rough-cut rabbet faces of die-cast motor bracket. As with roughing toolholder, post is at 4° with normal axis of cutter

ground with a shear-cut edge to produce a 32-mu-in. rms finish or better, and are mounted in hydraulically-actuated pivoted bars for tool relief on the return stroke of the table. Each boring bar is pivoted in a 3-to-1 ratio, permitting magnification on the 0.0001-in. dial indicator used for boring-bit adjustment.

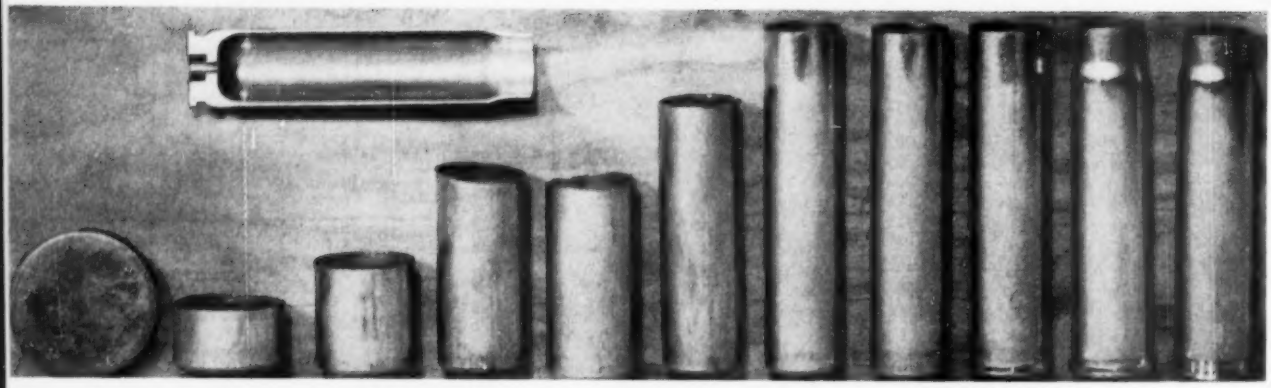
The rough and finish turning, facing, and chamfering tools, which take their cuts after the boring bits have passed through their bearings, are of unusual design for this type of application. They are four-blade circular form tools with carbide tips brazed to each of the four faces, and are mounted on posts having micrometer-adjustment sleeves, like those commonly used for boring. These tools were developed when it was realized that an appreciable part of each productive day was spent in tool adjustment after replacement of dull single-point tools.

Using four-faced circular tools, it is possible to quickly reset a new cutting face by rotating the tool 90° to a setting gage position. Also, their use has resulted in considerable reduction in tool cost and tool maintenance.

Toolholders supporting the rough turning and facing cutters are spring-loaded, hence they feed forward to approximately 0.005-in. of the face of the rabbet fit; then are stopped by fixed buttons while the table continues to feed forward and bring the rigidly-mounted finishing tools into position. These tools finish the OD and face of the rabbet fit at a 1° back angle to insure an interference-free corner. Meanwhile a separately mounted four-blade chamfering tool cuts a 1/64-in. x 45° chamfer on the entering edge of the rabbet fit.

Machine cycle time for this combination of boring, turning and facing operations is 10 sec, and the setup assures concentricity of the bearing bore with the rabbet fit by accomplishing all cutting operations without need for rechucking the parts.

"I suggest we tell Joe to get a new one or get out of the car pool."



A B C D E F G H I J K

STEPS IN PRODUCING 20-mm brass cartridge case: *A*—disk, *B*—cup, *C*—first draw, *D*—second draw, *E*—bump, *F*—third draw, *G*—fourth draw, *H*—indent, *I*—head, *J*—taper, *K*—finished case. At top left is a section of the finished case. Annealing operations follow *A*—blanking, *G*—cupping, *D*—second draw, and *F*—third draw

DIE LIFE IS UP 18 TIMES WITH

for operations on 20-mm brass cartridge cases

BY J C NEEMES, JR., In Charge, Twin Cities Technical Section, THE INTERNATIONAL NICKEL CO

Ductile iron is proving a cost saver in both dies and machine parts at State Foundry & Machine Co., Cedar Grove, Wis. Dies are for several steps in the production of 20-mm brass cartridge cases, and machine parts include crankshafts, slides, gears, and connecting links on presses and headers.

Ductile iron (produced by licensed foundries under patents of the International Nickel Co) is produced by the same general methods as gray iron, except that magnesium is introduced, causing the free graphite to take a spheroidal shape instead of the normal flake form. The resulting material is heat-treatable. Hardenability and surface hardness can be controlled over a broad range by alloying and by varying quenching temperatures.

As with steel, the carbon content, other than graphite, together with carbide-forming elements, determines surface hardness, but carbon has little effect on depth hardening. An addition of 0.30 to 0.35 Mo will produce a hardness of 55 R_c at 2 in. on an end-quench hardenability test when quenched from 1750 F. This hardness indicates the possibility of usefulness as a die material. The free graphite contributes to desirability because of its lubricating qualities.

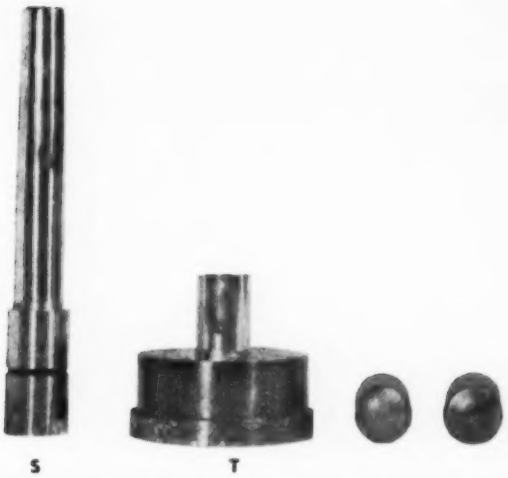
First die tried by State Foundry & Machine in producing brass cartridge cases was the holder and die for the heading operation. They are mounted in a No. 6 Bliss horizontal heading machine. Development work indicated the length of the die should be increased slightly, the holder shortened. Best heat-treatment was a full anneal of the casting, rough machine, harden, grind, and hone. The bore is differentially hardened by oil quenching to 55-58 R_c. After quenching there is a 375 F stress-relief treatment.

Records of die life for this operation existed from World War II. Life of a tool-steel die was 40,000 to 60,000 pieces. The ductile-iron dies are averaging 875,000 pieces, an advantage of about 18 to 1. The new dies also cost somewhat less, but this saving is negligible in relation to the savings from longer die life.

With this experience, ductile iron was tried on the die for the bumping operation in a No. 86 Bliss straight-side press. Design and heat-treatment are similar to that for the heading die. Performance-life figures are not yet available, but there is enough experience to indicate that they will equal or better the life of those made from tool steel.

A third die, now used experimentally for the tapering operation in a No. 185 Bliss horizontal ma-

HEADING-OPERATION DIES (blank is *H*, product is *I*, in sequence of steps): *M*—mandrel, *N*—die (top) and holder (bottom), *O*—normal product of heading operation, *P*—product when two parts are loaded in error, *Q*—punch. Holder and die are ductile iron



BUMPING-OPERATION punch and die (blank is *D*, product is *E*, in sequence of steps) flatten the bottom of the cup following second draw. Cartridge cases, before and after bumping, are shown at right. Die is ductile iron and similar in design to heading die

DUCTILE-IRON DIES

Heading, tapering, and bumping dies of heat-treated ductile iron at State Foundry & Machine Co indicate additional possibilities for this new material. In the same plant, annealed ductile-iron header crankshafts provide long, quiet life

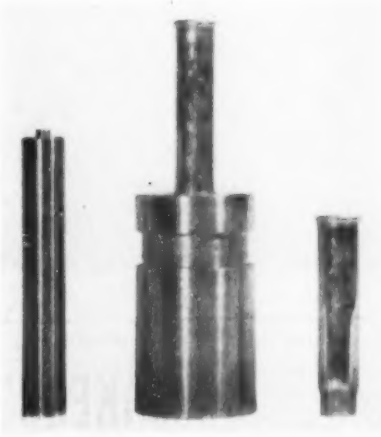
chine, replaces a tool-steel die with tungsten-carbide inserts.

DUCTILE-IRON CRANKSHAFT

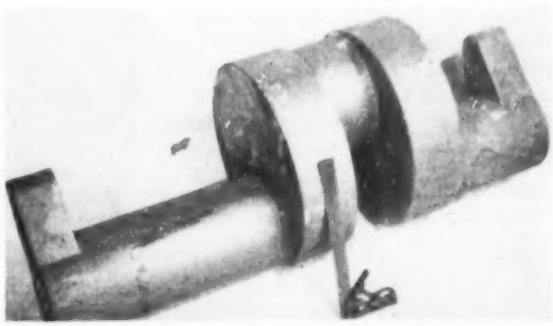
The heading operation subjects both dies and machine to severe shock. Crankshafts, forged from AISI 1050 steel and heat-treated, have had a life of about six weeks. A design modification improved this life. More recently, when delivery of a replacement was delayed, a duplicate of the redesigned steel crank was cast of ductile iron. Given a full anneal and machined, it was installed in the header as a temporary measure. This crank has already outperformed the steel cranks of original design, and has shown no sign of failure yet. It has the added merit of operating more quietly than the steel cranks.

Most responsible for this performance is believed to be the good damping characteristics of ductile iron, which make it less notch sensitive, raise the fatigue limit, and account for the quieter operation. A second factor is the lubricating properties of the graphite.

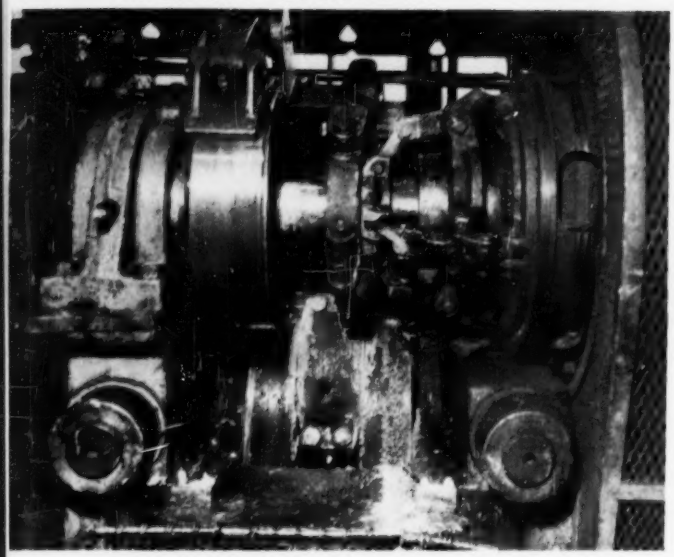
The most severe test of machine and dies comes when a double blank is fed, either because oil-coated blanks stick together or one part is not ejected before the next blank is fed. The result is shown in the illus-



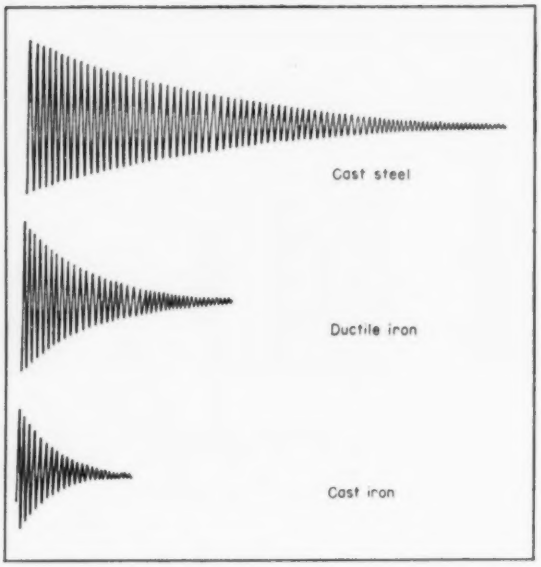
TAPERING OPERATION requires this punch and die (blank is *I*, product is *J*, in sequence of steps). Die is shown with part inserted and a tapered case (nose end closed in) is shown at right. Ductile iron die being used experimentally replaces tool-steel die with carbide inserts



CRANKSHAFT of ductile iron for header in rough-cast condition



REAR OF HEADER with crankshaft installed shows two cheeks of ductile-iron crankshaft and connecting-link cap



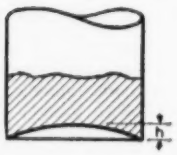
DAMPING CAPACITY CURVES for cast steel, ductile iron, and cast iron. This curve shows ductile iron in as-cast condition. When fully annealed, as in a crankshaft, damping capacity should be improved

tration of the heading die, which includes a normal part and the result of double feeding. Both dies and crankshaft of ductile iron have survived this mishap. As a result of this experience, State Foundry & Machine is equipping the rest of its headers with these cranks.

Slides on the No. 185 horizontal machine used in the tapering operation also failed in service. Slides made of ductile iron have now been in service for a year and a half. Similar replacements have been made of bull gears and connecting links on the large presses and drive gears on the headers. No failures have occurred, though some have been in service for more than two years.

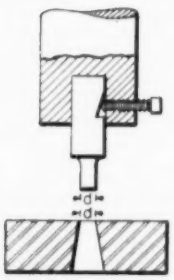
DIEMAKERS' KINKS

BY FEDERICO STRASSER

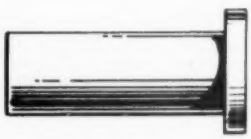


HOLLOW PUNCH FACES have better shearing action on soft stock. When the thickness is less than 0.040 in., use a value of $h = 2\ t$; for heavier material, $h = 1\ t$.

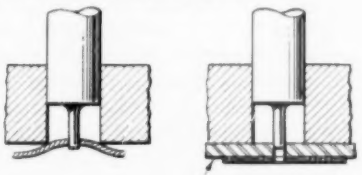
REINFORCING RIBS on stampings, especially on bent workpieces, will increase their stiffness by 100 to 200%. Height of the ribs should be twice the stock thickness and inside radius of the rib equal to the stock thickness.



TO ALIGN round piercing punches for heavy stock, make dummy punches from soft steel and with the cutting section a sliding fit in the die. First, fasten the dummy punch in the holder and use it to align the die. Second, replace the dummy punch with the hardened punch made with the proper clearance. By this procedure, you will get equal clearance all around the punch.



PUNCHES for stock 0.08 in. and thicker should have an enlarged head for better distribution of the pressure against the punch plate and to prevent pulling out a punch from excessive stripping pressure.



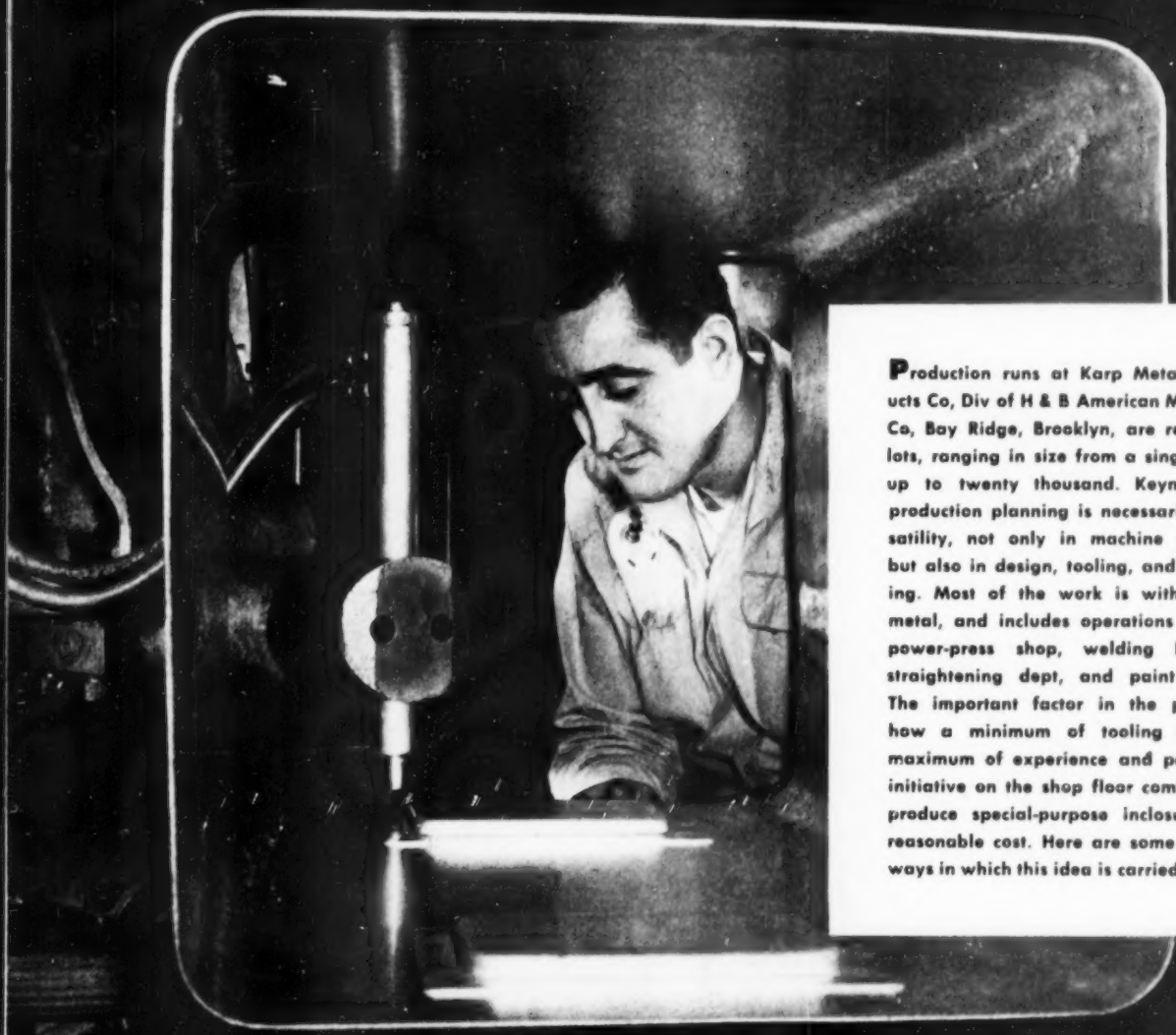
SMALL PUNCHES are made with a thick body for better support. When stripping, the stock may follow the punch. To avoid this inconvenience, provide an auxiliary stripper made from hardened tool steel.

even perfect housings don't require perfect tools when...

"QUICK-and-DIRTY" SETUPS

make clean, custom, close-tolerance inclosures

By CHARLES EMERSON and JOHN WRIGHT, ASSOCIATE EDITORS



Production runs at Karp Metal Products Co, Div of H & B American Machine Co, Bay Ridge, Brooklyn, are real job lots, ranging in size from a single unit up to twenty thousand. Keynote in production planning is necessarily versatility, not only in machine setups, but also in design, tooling, and finishing. Most of the work is with sheet metal, and includes operations in the power-press shop, welding booths, straightening dept, and paint shop. The important factor in the plant is how a minimum of tooling and a maximum of experience and personal initiative on the shop floor combine to produce special-purpose inclosures at reasonable cost. Here are some of the ways in which this idea is carried out...

American Machinist SPECIAL REPORT NO. 350 TO THE METALWORKING INDUSTRIES

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getting the

"We can tell you, at any time, how much your job has cost to date and how much longer it will take."

Production control in many jobbing shops is a slapdash affair with little meaning and even less chance of success. Karp, however, has found it to be most important on a cost basis to keep tabs on each job going through the shop at all times. There may be as many as 300 different orders in the works in a given day, so the control system must be simple and accurate.

Crux of the system is the individual responsibility of each foreman for all jobs in his department while they are under his jurisdiction. He may be called on the carpet if anything goes wrong, and may have to give a reasonable explanation for the delay—though Karp management makes no practice of creating "goats" when holdups do occur. For this reason, it is most likely that a foreman will give notice to the main office when he sees trouble coming instead of waiting for management to find out.

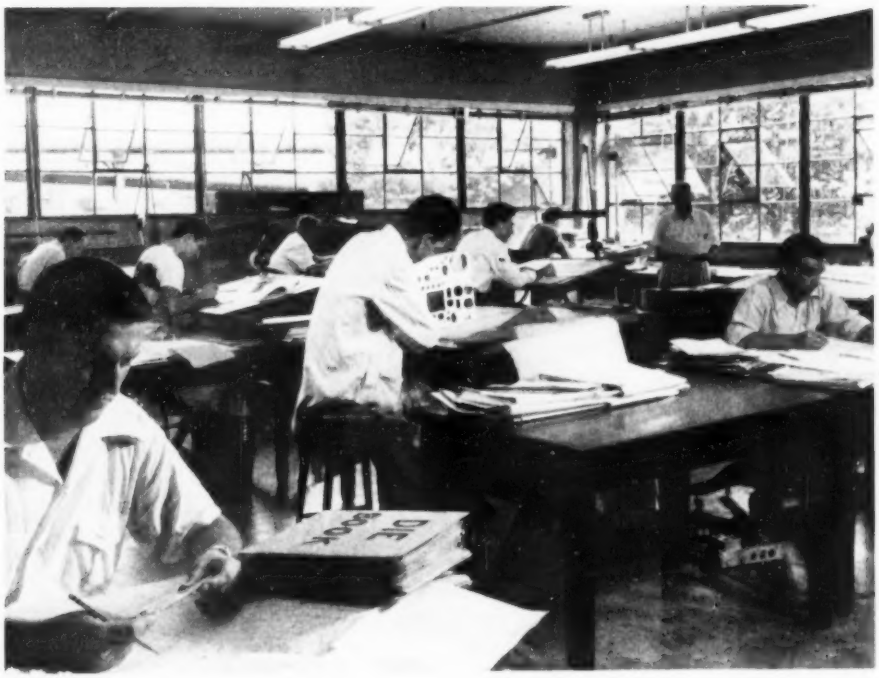
Two main record forms are kept up. One is a time card issued to each man when he starts a shift or starts a new job. This is time-stamped, and the job number is entered on the card. When the man finishes his work on that order, or when he finishes his shift, he turns in the card, which is again time-stamped and filed. Each man must have card time for his total working hours, which insures that the foreman will receive cards for all work done. At the end of each day, therefore, the foreman can pull filed cards and total the hours spent on each current job.

The other record is a report slip with spaces for indicating labor, materials, and overhead spent on whatever job is being reported. The foreman checks off his department on the list of departments on the slip, totals his time-card records for labor, and sends the report to the main office. He may do this voluntarily to tell management that the job has been running slow, or he may send the report in response to a request.

When reports from all foremen have been received, the main office can total up the work done so far on the job and estimate what is left to do. Any indication of trouble shows up immediately as excess time and is a signal flag for a checkup.

NEW JOB STARTS with estimating; costs of material, tooling, and labor are calculated, time is estimated, and methods are planned. Sample part or print submitted by customer may, with his permission, be redesigned in minor details to conform to existing Karp tooling. If new-tool design is necessary, costs may be absorbed and written off on large order; or customer may own tooling, which can be held for him.

new job in the works

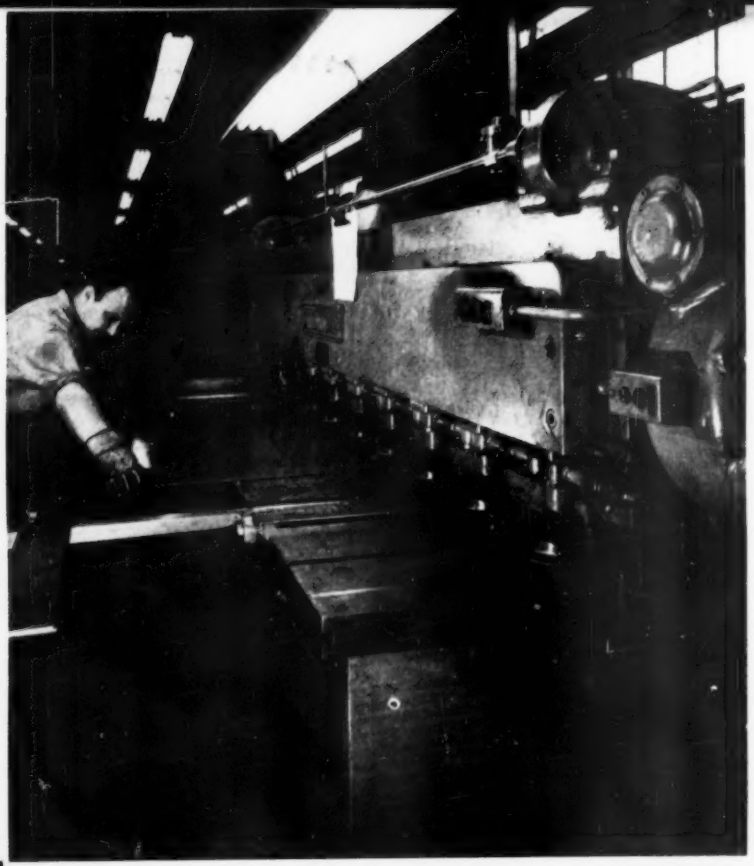


DIE BOOK is the "Bible" for production planning as well as estimating. It lists 3000 dies by type, capacity, and size. Engineer here is detailing factory order (an enlarged B/M) indicating stock, size, bends, tools and dies, critical dimensions, and finishes. On a complex job he will also include sketches to explain each operation. Order stays with job until acceptance of finished work by inspection department.

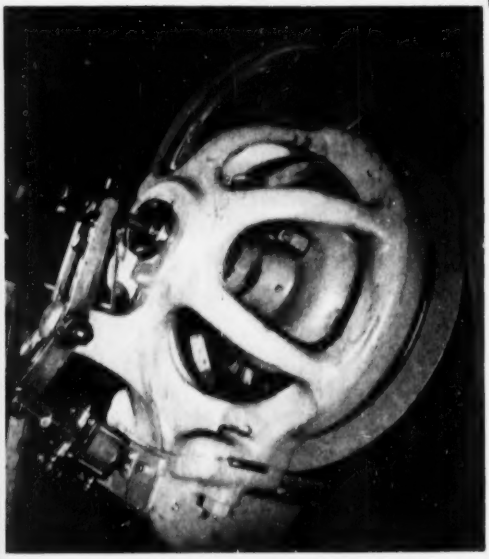
DIE RACKS fill one end of main shop bay. This is balcony where small diesets for louvering, embossing, extruding, nibbling, and perforating are shelf-stored; and individual punches, dies, and sectional-die parts are held in drawer files. Floor below holds larger dies for multiple piercing, blanking, forming, and drawing. Same 5-ton crane that serves stock floor lifts dies to and from racks

LAYOUT DEPARTMENT prepares master templet from first piece blanked according to working drawing. Templet layout shows dimensions, hole sizes and locations, and bend lines; and will accompany job as a guide and checking gage for setting up all operations and for inspection. After job is done, templet is stored (in racks, background) for future reference. In toolroom, master toolmaker makes die layout and selects die material based on production run

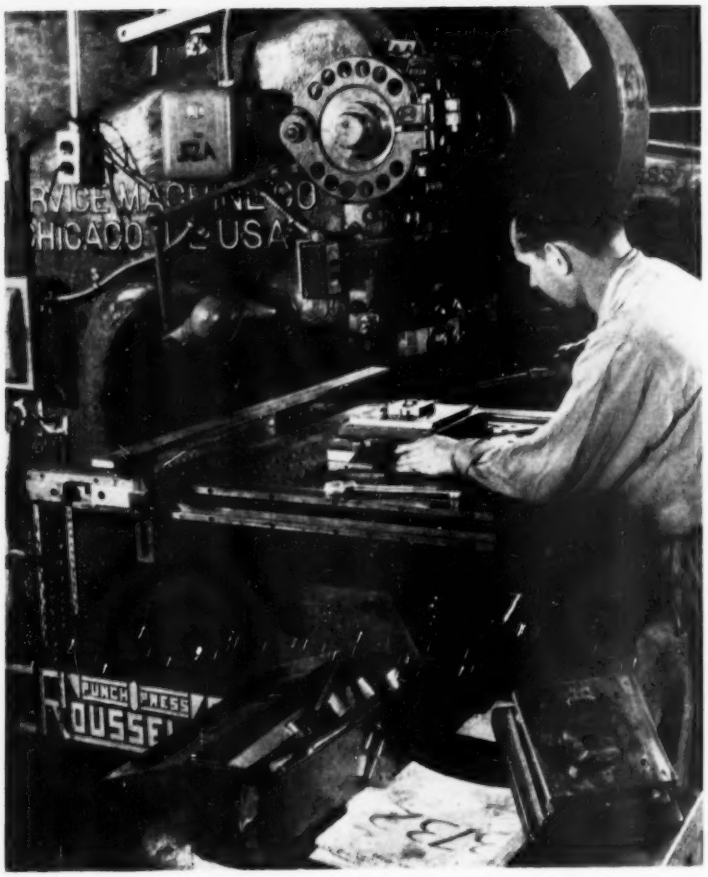
ingenuity on every operation



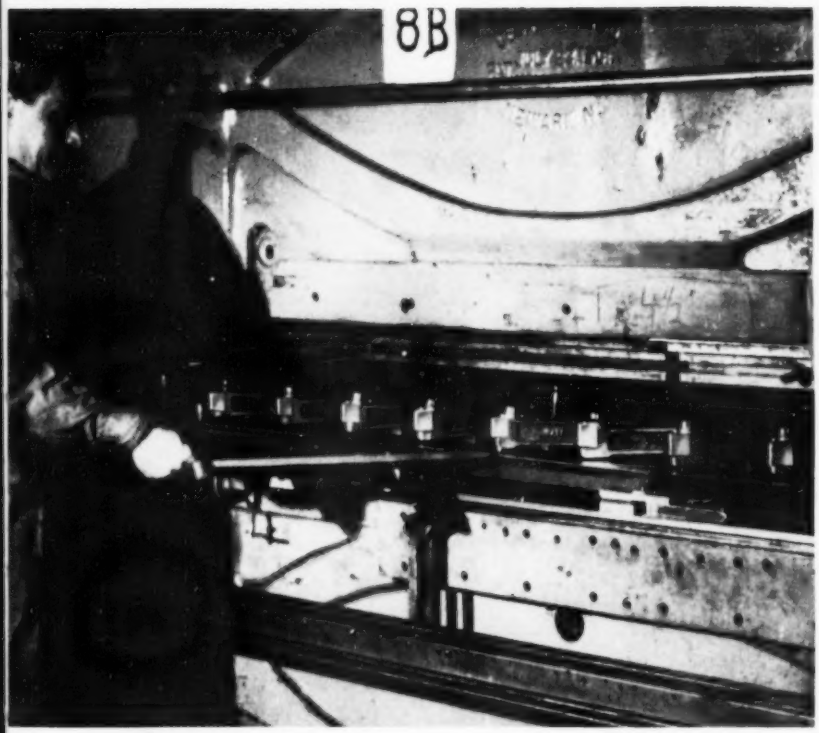
CUTTING-DEPARTMENT SHEAR, one of a number of Cincinnati's, trims steel up to ¼ in. thick and 12 ft long to ±0.015-in. accuracy. Hydraulic hold-downs and magnetic rollers behind blade keep stock flat and aligned accurately against side and rear micrometer stops. Three sets of blades for each shear are maintained; one working, two resharpened, to assure repeated accuracy and to eliminate camber, twist, and burr on edges that will later act as banking surfaces for tooling



PNEUMATIC CLUTCHING ARRANGEMENT added to a 225-ton, double-crank press replaces old mechanical-lever rig that was slow and dangerous. New clutch is faster, and allows more accurate inching during setup work. Press is second largest in shop, and is operated mainly for blanking and drawing shapes to a maximum depth of about 5 in.

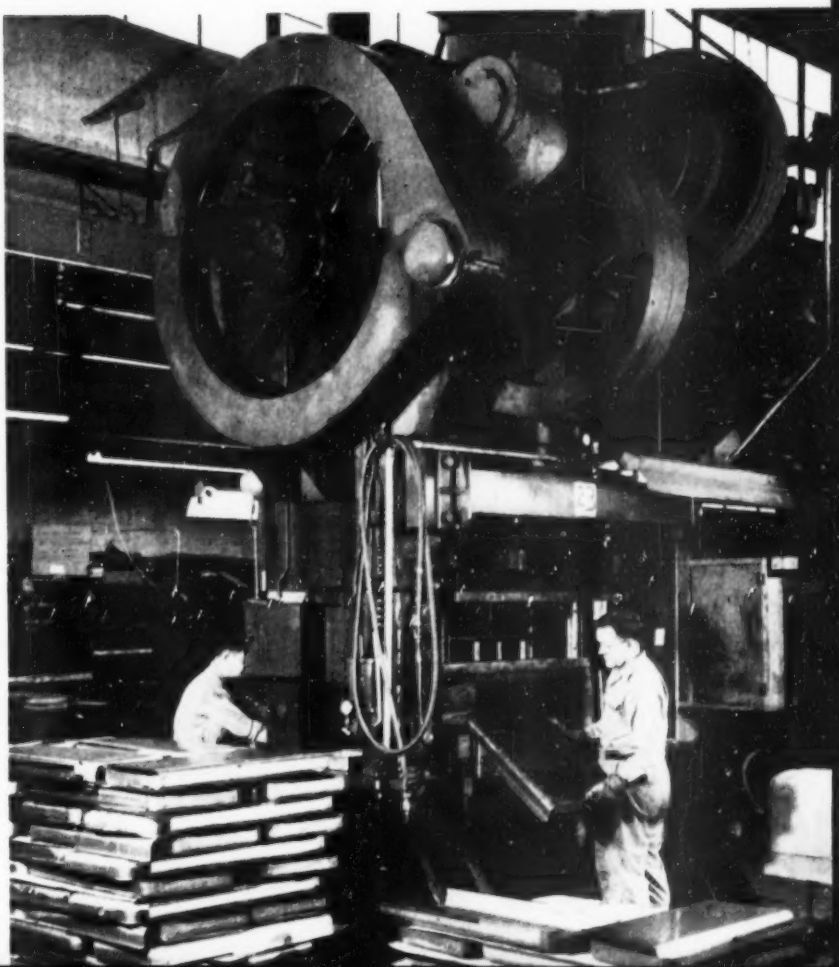


MOST SETUP MEN ARE OPERATORS, TOO; an advantage on small lots where production time is not much more than setup time. "Quick-and-dirty" setups on universal bolster plates are necessary for the majority of jobs. Back and side gages align work over any of a large number of dies that can be set up here.



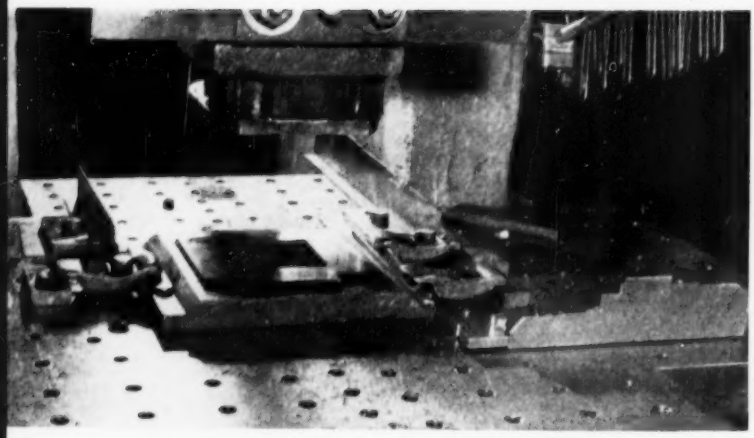
OLD PRESS BRAKE, headed for junk pile, was salvaged for occasional jobs by mounting Wales-Strippet diesets for simple multiple-hole piercing work. Punches can be interchanged for any hole diameter and profile within size range of diesets, and almost any reasonable number of holes in a row can be punched

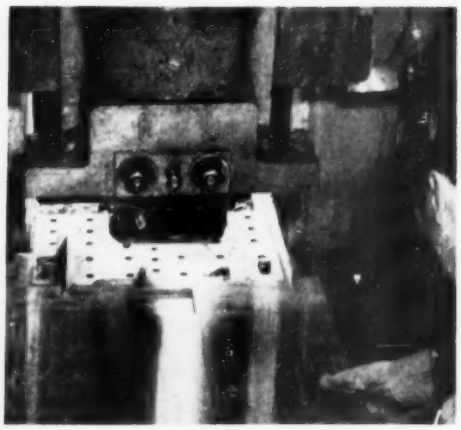
"NAILBOARD," or pinboard (above, right), checks for broken punches in multiple-punch dies where there is a large number of holes being pierced (sometimes as many as 125). Every 25th piece is checked. Small holes are represented on board by nails projecting through. Blanked and pierced stock is placed over board—if stock will not drop over board, press operator knows he must look for a broken punch



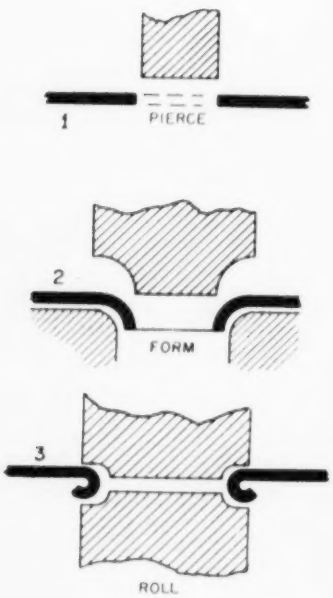
DRAWING IS DONE in Niagara 285-ton geared press. Job is inclosure panels with one end open. To prevent stock from shifting under punch, a piece of scrap stock is loaded next to the open end of each blank to equalize load under pressure pad and punch. Scrap piece is drawn, too, but discarded

"quick-&-dirty" setups





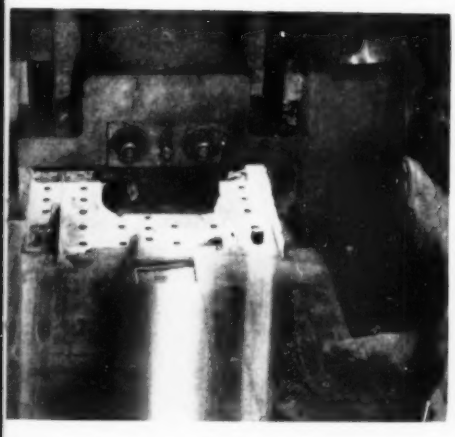
STEP GAGES on punch press permit notching out rectangular hole that is larger than standard Karp die. There are two rear gages and one side gage to permit locating and squaring the stock for each stroke. (See progressive notching in sketch, right)

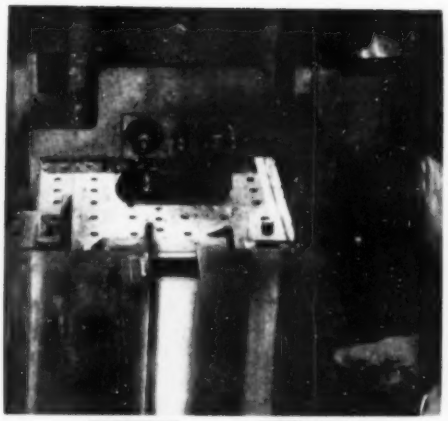


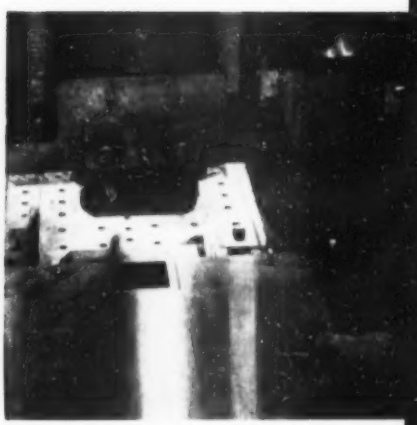
GROMMET DIE forms flared grommet in stock, replacing more expensive inserted grommet. First punch pierces hole undersize to leave stock for drawing; second starts the drawing action and pushes up a collar; third completes the grommet by forcing the stock back on itself. Grommet roll may not be a complete circle, but this is not required because a partial grommet will protect wiring. Completeness of grommet shape depends on stock thickness, temper, and ductility, and on original hole size and punch contours

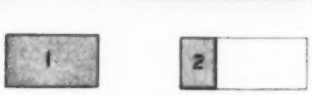
CENTERPUNCH DIE is solution for problem of large number of holes of small diameter in thick stock. Here ¼-in. aluminum plate is run through press cycle with positive-location dieset, but with centerpunches replacing piercing punches. Stock is next sent to drill department where no fixturing will be required

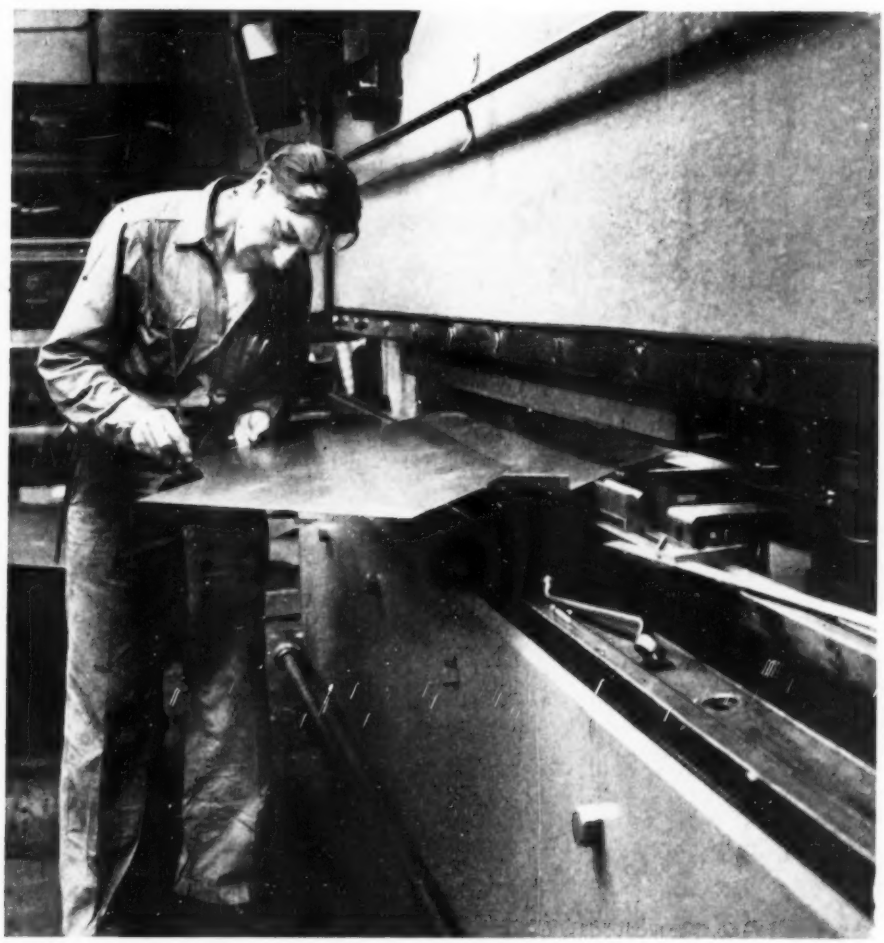
prove versatile





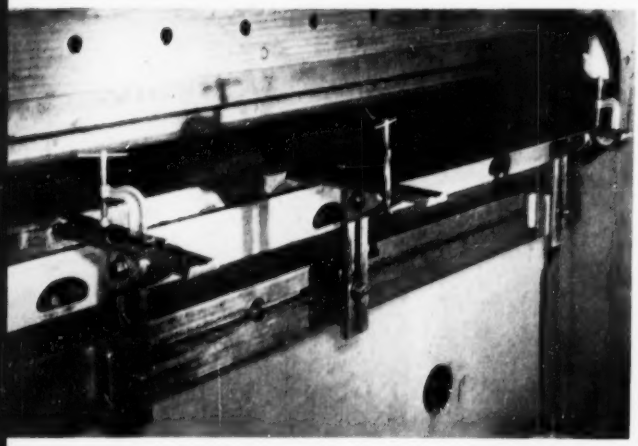


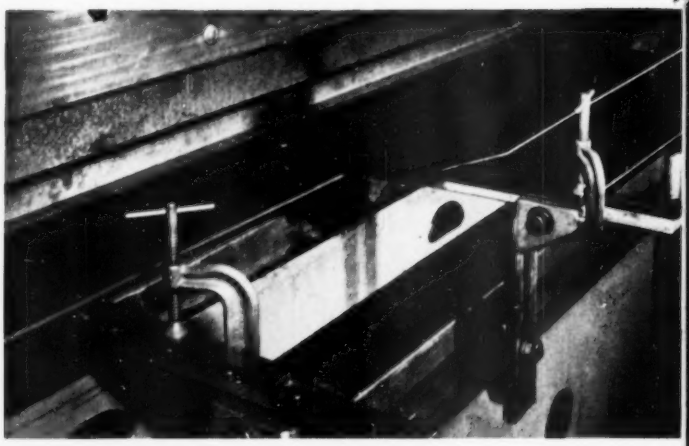




TRIAL BENDS are made on brake dies from first piece blanked as a double check on bending allowances and to insure ease of assembly of component parts. It further safeguards against overlapping seams that will be welded on wrap-around skins that form inclosures

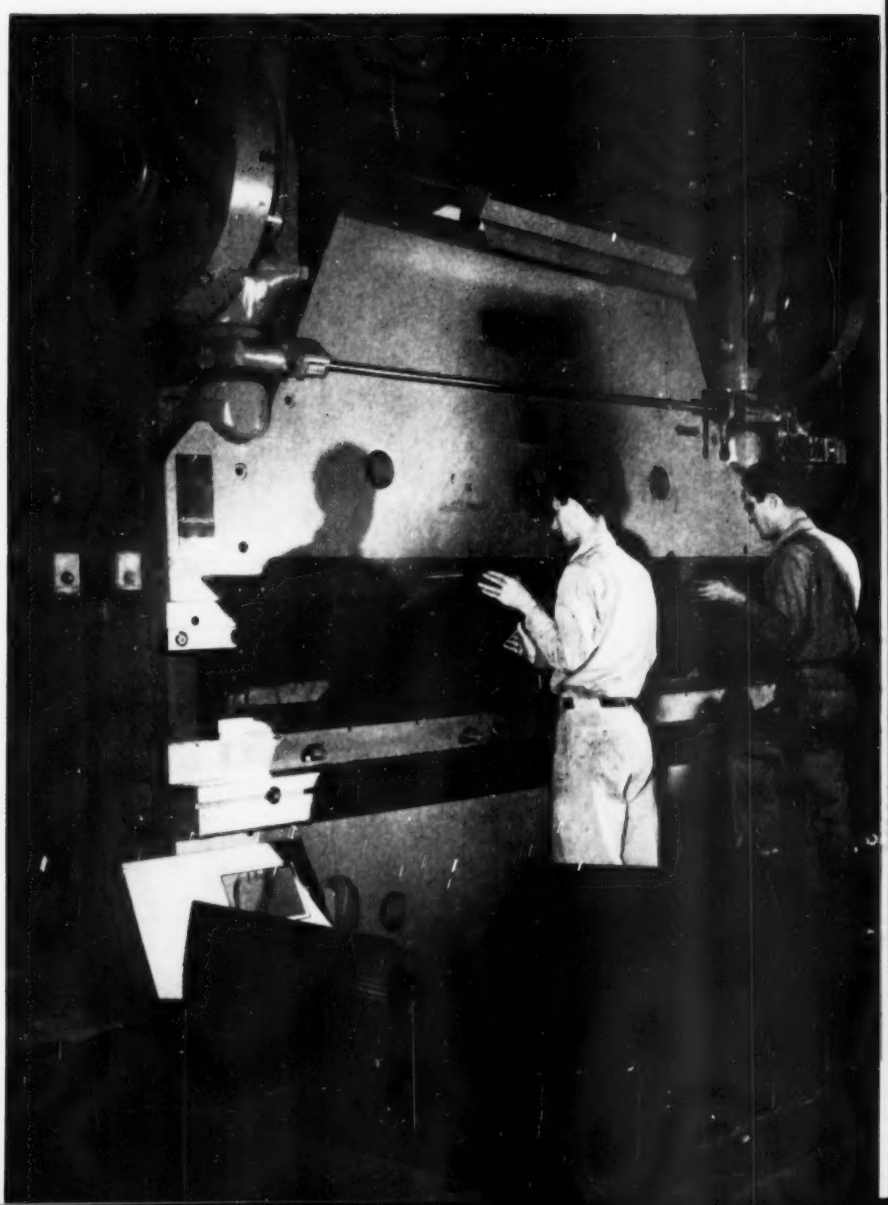
bending variety with one setup





HINGED STEP GAGE (above) sets up multiple bends on press brake. As many as four hinged steps have been used at one setup, with operators flipping steps as stock is cycled through bending operations. Setup must be OK'ed by inspection department after first piece on job has been fully bent, before remainder of lot can be run.

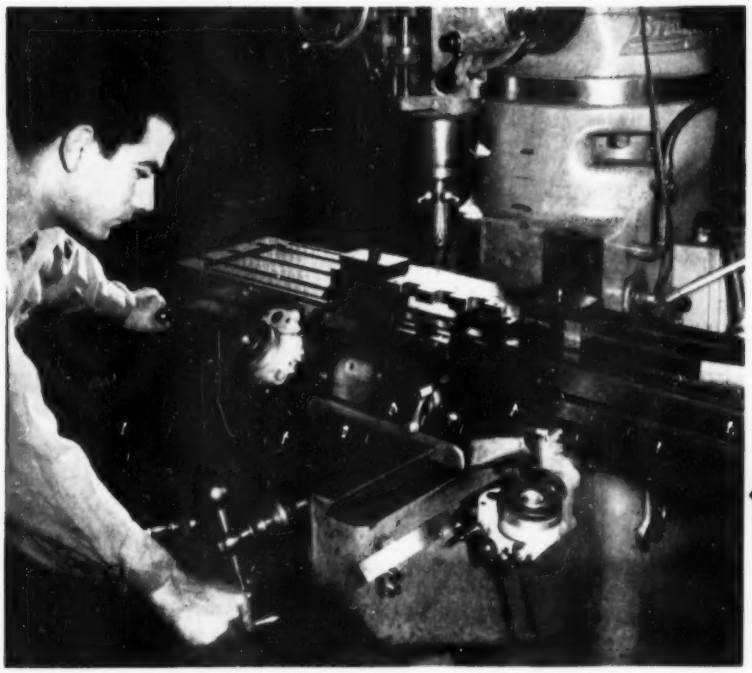
DOUBLE SETUP on Cincinnati 16-ft press brake makes use of length of bed by combining two small jobs with different stops, but similar bends. Press can handle up to ¼-in. steel stock over full length of bed, so even three or four jobs can sometimes be run at once.



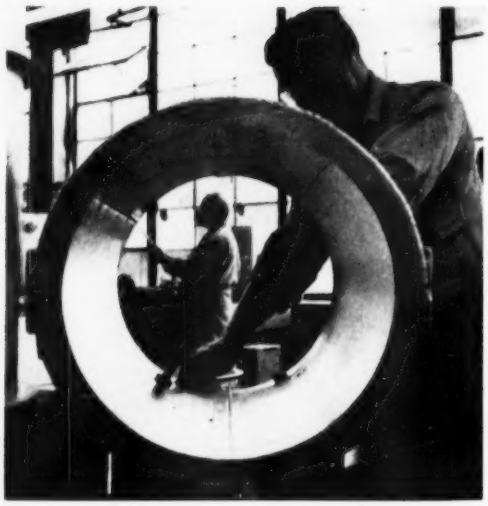
DRAWN-BLANK TRIMMER is a modified Dayton-Rogers unit with pneumatic hold-down operated by pushbutton. Cutter is solid 6-in. steel disk mounted on driving arbor; matches against shear ring inserted in wood or metal mandrel that supports and rotates with work. Machine trims off flange to required shell depth eliminating costly side-action dies

toolroom maintains dies ready for immediate re-use

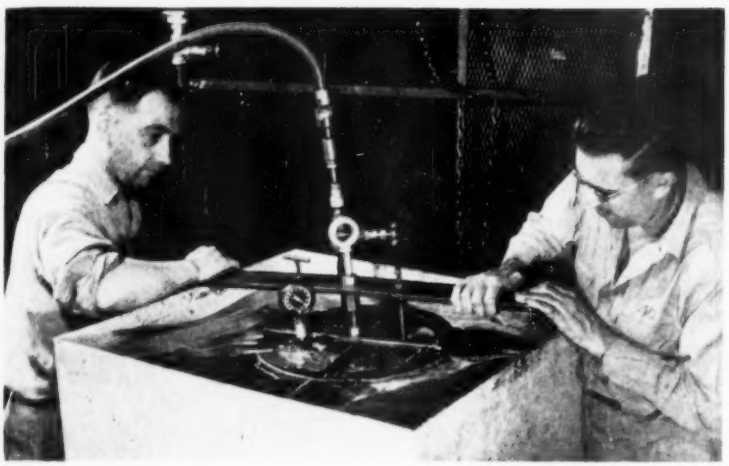
SECTIONAL BUILT-UP PIERCING DIE is made up of stock die inserts and die-section hold-downs. This one pierces 34 small holes, 6 notches, and 4 large cutouts, and is in process of being resharpened immediately after a production run. Thus, all dies in racks are in condition to be set up for work at any time



TOOLROOM EQUIPMENT includes Bridgeport miller to which Griswold "Scan-a-scale" optical vernier sights and scales have been added. Graduations are to half a thousandth; magnification permits reading to ±0.0001 in. Machine is utilized to a degree of accuracy not possible with standard dials and leadscrews, permitting jig-boring of templets, fixtures, jigs, and dies



special



This order was for a precise electronics inclosure which many people thought could not be fabricated from sheet metal. All critical nominal dimensions called for a tolerance of ±0.005 in. Karp tackled the job and turned out what was perhaps one of their best examples of close-tolerance enclosures made with "quick-and-dirty" setups.

The following is a modified version of the factory order that accompanied the job through the shop. It shows what special problems the work presented. The five photos illustrate the methods, tooling, and special techniques that were worked out to produce the finished product.

OPERATIONS

10 Purchase fabricated 22-in.-dia aluminum cylinder.

20 Rework ID to a nominal diameter and for roundness; rework ends of cylinder for straightness and squareness for tooling purposes and secondary operations.

30 Mount in welding fixture K 300. Heliarc tack-weld two channels longitudinally parallel within ±0.005 in. to each other on OD, holding angular tolerance of ±30 min.

Tack two rails to ID in line with each other and perpendicular to common-centerline channels within ±0.005 in. (Rails used for mounting electronic-equipment chassis in final assembly).

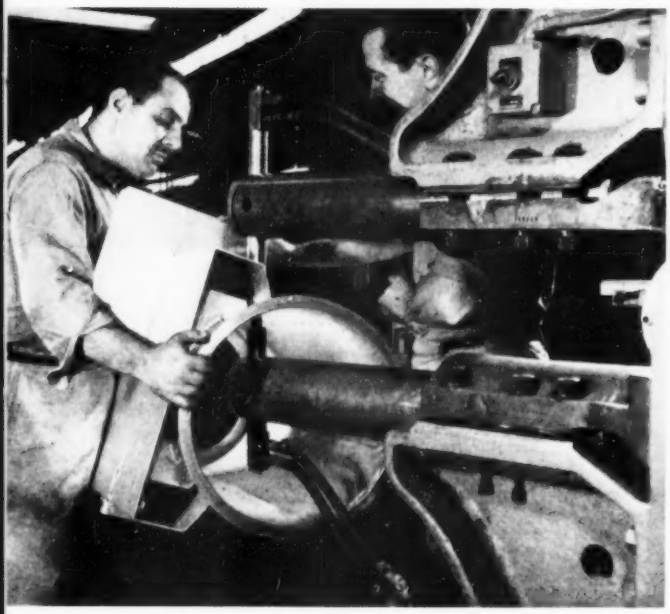
Continuous-weld outer-ring flange to one end of cylinder and inner ring on opposite end. Note: Hold outer face of flange parallel to inner face of ring within ±0.005 in.

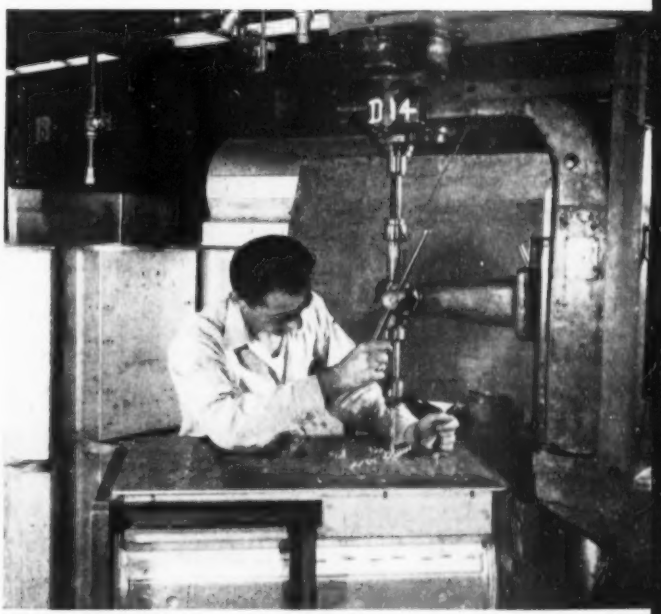
40 Rework ID per operation 20 (top). Mount outer face of flange on surface plate and check flatness to 0.002-in. feeler gage. Rework face to gage.

50 Rough-lap outer face of flange flat and remove all radial scratch lines. Use rotary lapping machine K 500 (above, left).

Note: Machine was designed and built by Karp on the lines of a lens grinder. Abrasive-cloth sheet was clamped to rotary table which operated at moderate speed. Concentric guides permitted cylinder to oscillate slightly.

job shows how Karp operates





Alternate down pressure was applied by operators until required finish and flatness was acquired. Coolant was a mixture of kerosene and alcohol.

60 Load in test-stand fixture K 600; clamp O-ring seals against outer face of flange and inner face of ring. Hydrostatic-test (p 146, right) for leaks at 15 psi. Note area where mounting platform is to be attached, and check there for leaks.

70 Pierce reference tooling holes in center of mounting-platform blank, using piercing-and-blanking die K 700.

80 Form multiple bends, locating blank from reference holes—formed surfaces must coincide geometrically. Note: Keep mounting surface of platform flat.

90 Nest platform in welding fixture, locating from reference holes. Insert expansion spider in ID of cylinder and, with leadscrew, expand spokes snugly against cylinder wall. Place cylinder over mounting platform and nest flange end on rigid stud; ring end on sliding stud. Bank channels against stops. Insert tie rod through cylinder studs and draw up sliding stud against stop. Locate and clamp ends of platform to cylinder OD. Note: Mounting surface of platform must be parallel to within ±0.005 in. of common reference centerline channels. Tack-weld ends of platform to OD.

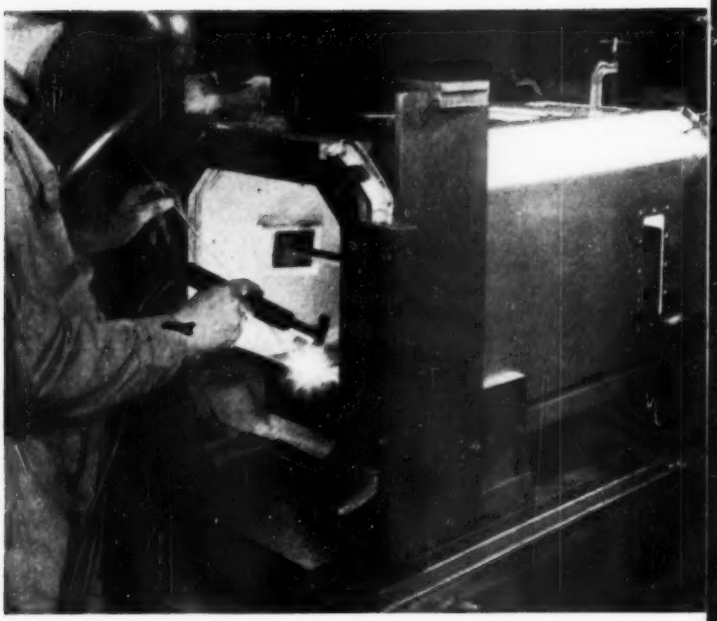
100 Spotweld edges of platform, channels, and rails (for strength and rigidity) between welding tacks throughout assembly (above, left).

110 Finish-lap outer face of flange to V55 mu in. rms ("V" is customer designation). Mount felt pad on rotary table and use mixture of lapping compound, kerosene, and alcohol.

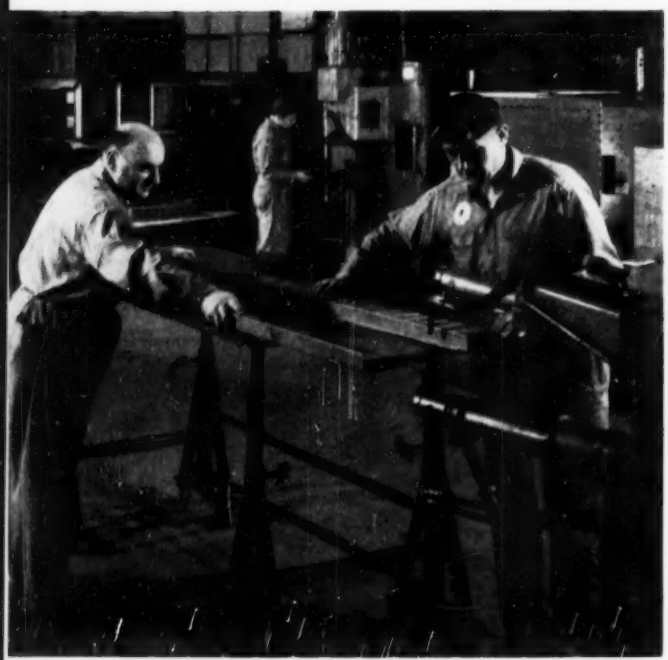
120 Hydrostatic-test for leaks as per operation 60.

130 Mount in drill fixture, locating from cylinder ends and banking against sides of channels and platform. Locate plate drill jig from platform reference holes and clamp against sides (above, right). Drill holes as per templet. Maintain ±0.005-in., c-to-c tolerance between holes.

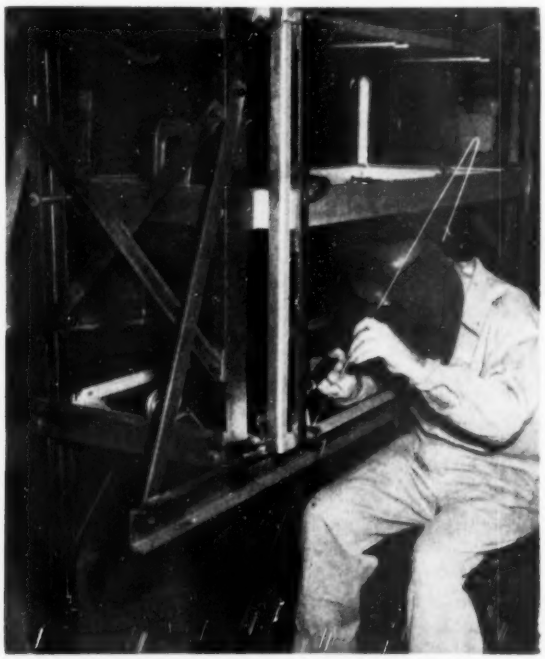
spotwelding aluminum is a specialty



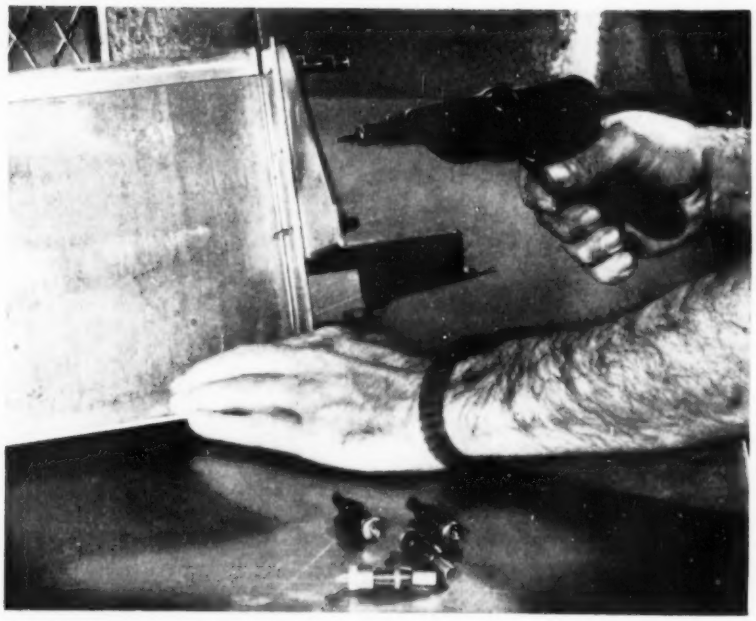
RIGID HELIARC WELDING FIXTURE has cutouts where cabinet panels are to be joined; heavy fixture construction permits rapid progressive welding around assembly without resorting to alternate pattern welding to equalize stresses. A second identical fixture holds another assembly while it cools. Compression bars inside assembly prevent buckling



"HAT"-SECTION STIFFENING MEMBER is spotwelded into large cabinet panel to provide strength and rigidity; also to support hardware for shelves. Components are located with strip gages that space them from edges of the inclosure. Some inclosures, made from stock 0.030 to ¼ in. thick, are hermetically sealed and tested for shock and vibration resistance. These are heliarc-welded to produce joints 150% as strong as the parent metal. Beads must often be ground for appearance, but the practice is avoided whenever possible to leave maximum strength and minimum chance of porosity



LIGHT WELDING FIXTURE that positions frame assembly of aluminum angles and channels is for short runs. Distortion is prevented by constant inspection-department checking on spacing of fixture elements and finished work; welder is notified when assembly comes out skewed, and clamps are added, revised tacking pattern adopted, or longer cooling time allowed

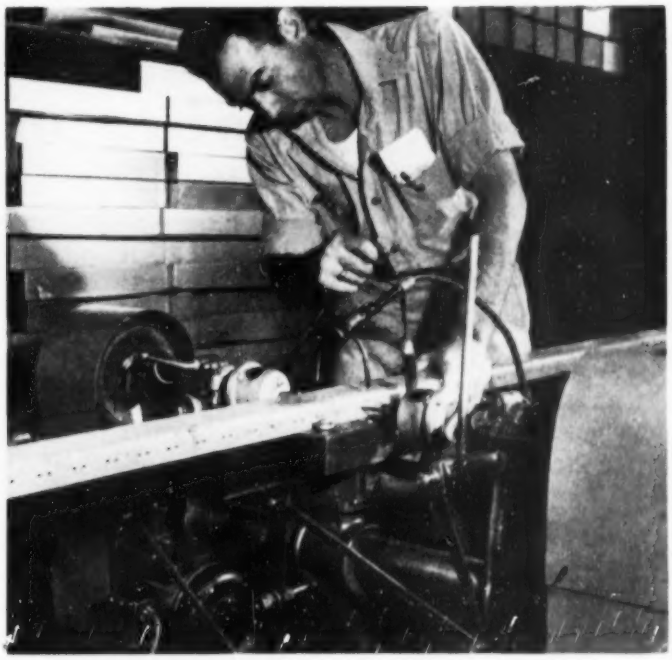


"CLECO" PINS are pushed through matching holes in assemblies of multiple plates to provide positive alignment before drilling, spotwelding, or heliarc welding. The pins are inserted by hand-held gun that moves a split pin forward through the holes. At release, the pin realigns itself because of spring loading. Accuracy is good because pin diameters are tailored for the holes they align. Pin technique eliminates costly fixtures, accumulative tolerances, and hand straightening

DESIGN SHORTCUTS UTILIZE STANDARD DIES, FEWER OPERATIONS

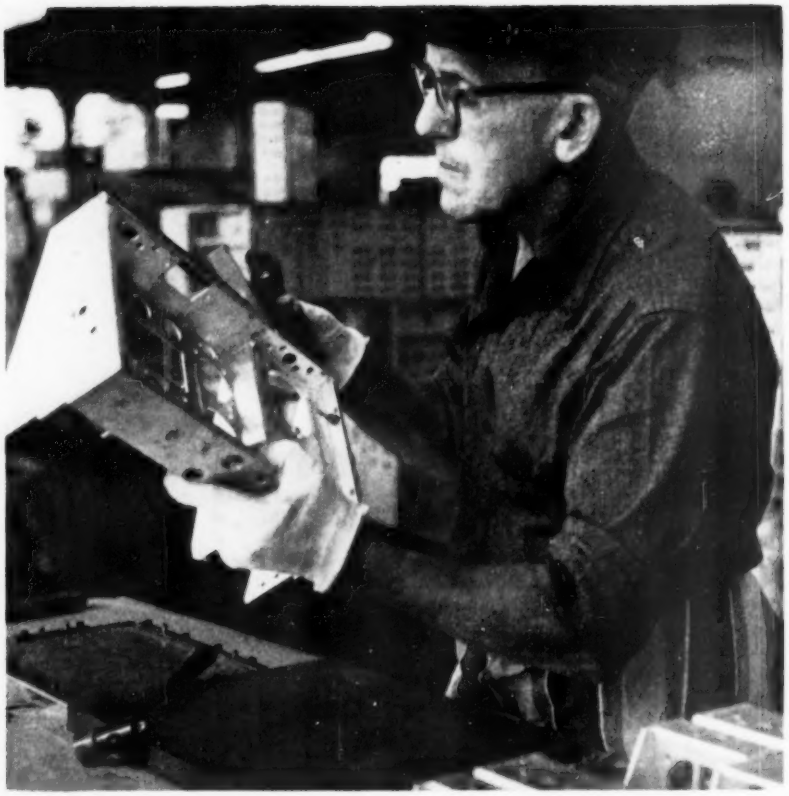
Recessed area for carrying handle (see photo of inclosure on frontis—page 137) is made by blanking out opening, then spotwelding drawn blank from a second die into place. Next, handle is added. If drawing had to be done on the wrap-around proper, depth of draw in relation to length and width of recess would have created distortion in the skin. Recess plate is standard item with Karp; and spotwelding is standard practice on aluminum where design permits.

DRILL JIG for job with relatively long run locates rows of holes around flange of aluminum sheet-and-casting weldment. Pins in jig plate register inside inner flange; machined surface of casting is banking edge for foot of jig plate. Cover is thus easily fitted centrally over the opening in the assembly department. All drilled, reamed, and tapped holes (class 2) are inspected 100%



DOUBLE OPPOSED-SPINDLE DRILL taps holes previously pierced in steel channel two at a time, doubling old rate of production. Two drillpresses were combined with spindles horizontal, and feed levers linked mechanically, to be operated by one man. Rollers below and on both sides of stock guide it and allow operator to align the work by eye, letting taps do the least amount of pulling to align themselves in punched holes. Setup typifies shop-originated designs at Karp

STRAIGHTENING DEPARTMENT takes up large area of production floor; includes hand operations such as fitting, buffing, straightening, and filing. Much of traditional plant accuracy, dependent on skilled old-time mechanics, is directly attributable to work done here. Fitting is sometimes done to sheet-metal gages, sometimes only to scale, sometimes to matching part or cover.



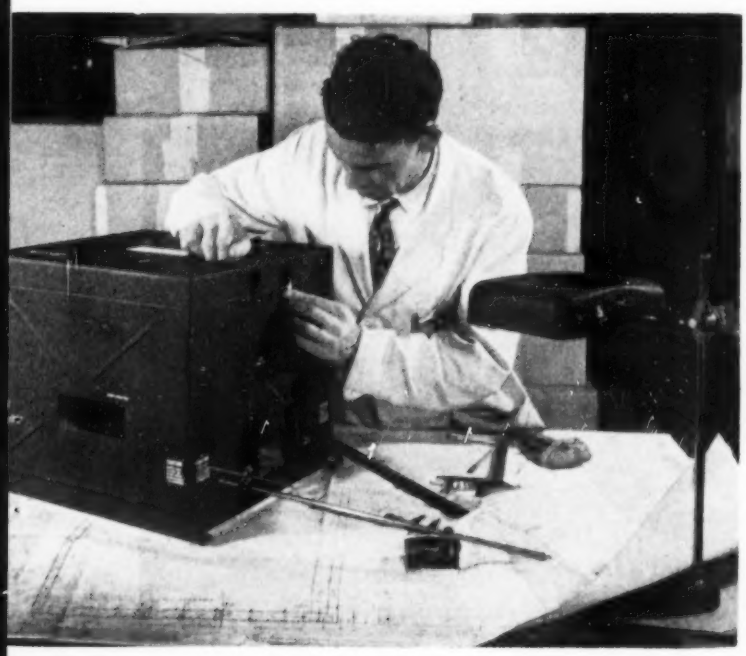
SMALL COMPONENTS like this 2¼-in. box can be built to precision standards, too. Box was blanked from sheet, including small pilot holes, then bent up and arc-welded. Four square blocks were welded into upper corners of box, then straightening department straightened sides to flatness within 0.005 in. to match sealing gasket. Large holes were then flycut using original punched pilot holes as reference. Remaining small holes were drilled with jig that located from large holes and was banked against upper edge of box. Drill jig located drilled and tapped holes in four welded-in corner blocks. Ring bracket was spotwelded to box.

quality in straightening

SIMPLE STRAIGHTENING RIGS, such as this one attached to a large enclosure, tighten up components to final shape. Welding strain is primary cause of distortions that must be removed. Straightening department also removes welding bead, if necessary, but hole deburring is done in drilling department.

TENSILE TEST is made periodically on spotwelded sample from each machine to check on condition and adjustment. Welded plates are pulled apart, readings noted, and fracture examined under microscope for porosity and crystal structure. If any early failure shows, machine from which sample came is shut down immediately and is then readjusted and double-checked before it resumes service

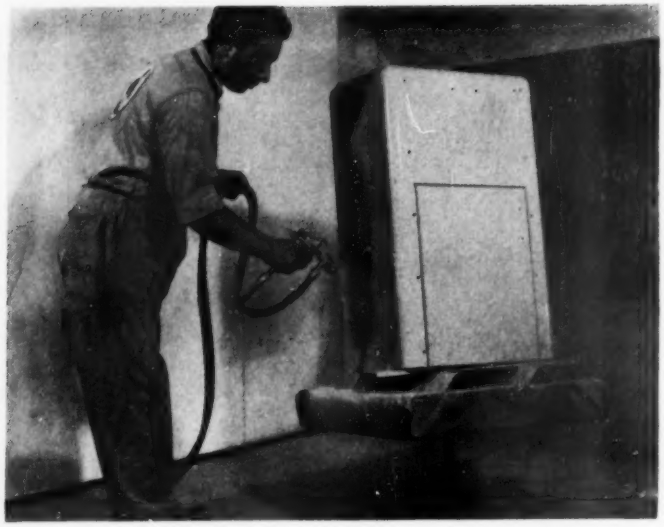
SHEET-METAL MECHANIC sets up work for welders. Here aluminum sand castings are aligned to ¼-in. aluminum housing that will mount radar equipment. Casting faces must be parallel and must be located to leave enough stock for subsequent machining. Next operation is heliarc-welding castings to frame. Many jobs redesigned by Karp as sheet-metal inclosures were originally castings



checking is vital in-process and after painting

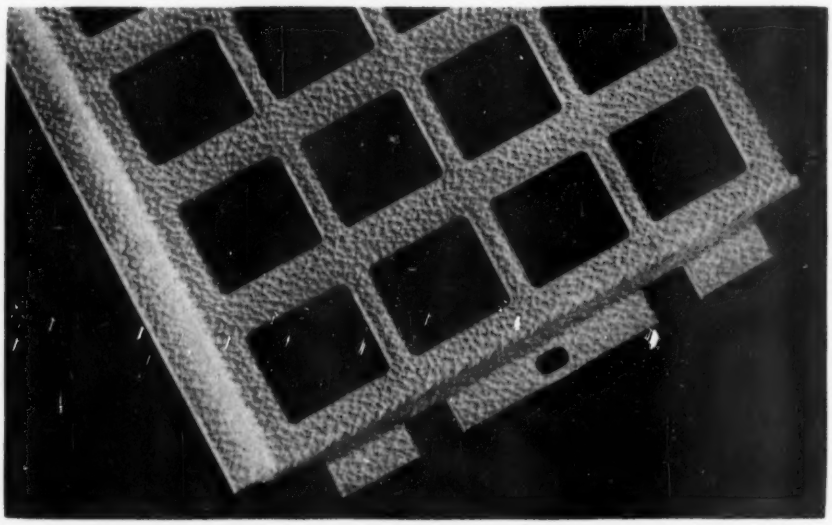
FINAL INSPECTION varies between jobs, but is usually strict. Dimensions from a banking edge or point, heights above the surface plate, surface finish on some components, and fit of sliding or operating segments is inspected. Inspection department uses factory order (blueprint) as guide

finishes come in all styles

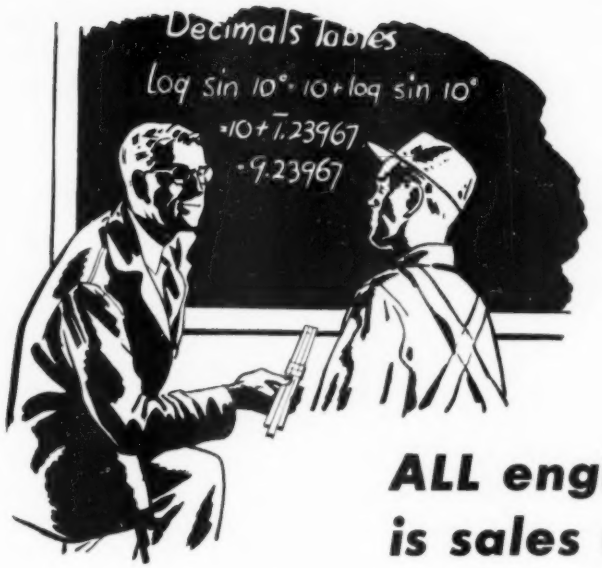


SPRAY ROOM is air conditioned, supplied with 75,000 cfm of clean, dry air and exhausted, with all booths working, at the rate of 60,000 cfm. This leaves a surplus of air in the paint shop, increasing air pressure slightly. Constant fume exhaust prevents flashback of paint particles that would otherwise deposit on inclosure. Result is smooth, even coating. When doors are opened, conditioned air gushes out into the main shop to prevent dirt and dust from entering

FINAL ASSEMBLY on painted inclosures includes addition of hardware, wheels, and other items purchased from outside suppliers. On special-finish job like this portable console, an extra coat of filler is rubbed down; then final coat of paint is applied. Cabinets will be shipped directly to buyer as finished packages



VINYL-COATED STEEL, a relatively new material, is worked through all departments to produce a business-machine inclosure that combines strength with durable, nonpainted finish. Material is protected during piercing and forming by keeping presses extra clean and inserting cardboard sheets between sheets of stock. Unusual clearances for punches and dies were worked out the hard way by trial and error; stock is pierced steel side up, which allows slight steel burr to be burnished into the vinyl. Plastic material comes out with slight raising at punched edges. Only major precaution in handling stock is that it cannot be worked cold — must be heated if plant has chilled over weekend



ALL engineering is sales engineering

Sales engineering is usually thought of as a separate branch of the profession, for those with sales aptitudes. The author points out that this is a fallacy—that every time an engineer solves a problem he has to sell his ideas to management. If the engineer doesn't have this ability, he is only partly ready for his job

BY CHARLES A MAYNARD, Vice President, INDIANA STEEL PRODUCTS COMPANY

Engineering is often thought of as a scientific profession in which the engineer's job consists of taking a problem and, by applying the laws of science and logic, finding a solution to the problem. This is true as far as it goes, but leaves out what is probably the most important step in the engineer's job. That step is the *sale*, and is most often neglected in the training of engineers and in an engineer's attitude toward his job.

The results and recommendations of the engineer's work must be passed on to others. How well he has solved the original problem and how well he convinces others that his recommendations are worth considering and putting into action determine the success of the engineer. Convincing the "powers that be" that the next step must be taken is the point at which the engineer really succeeds or fails. An engineer's everyday contacts are seldom with the ultimate customer, but rather with manufacturing, purchasing, management, and the sales and advertising departments. These are his customers, to whom he must sell his ideas and services, just as though he were selling to an ultimate customer.

Engineers take pride in their logical approach to problem-solving. Their approach is called the engineering method, and consists of these five steps:

A. Define the problem.
B. Obtain pertinent facts and data.
C. Apply the law of logic and natural sciences to obtain the solution to the problem.
D. Draw conclusions.
E. Formulate plans of action and follow through.

The problem of convincing someone that the next step is necessary is part of the last step of the engineering method, and is often neglected or is not given enough emphasis. Someone must be sold on the ideas. The engineer has a "customer" and is face-to-face with a sales problem.

TO SOLVE THE PROBLEM

The engineer should apply logic to the problem of presenting his findings and recommendations just as he would to any other part of an engineering problem. If he does this, the engineer will realize that engineering is not a domain in itself. It is part of a larger organization which has incidental and basic needs which the engineer must answer; the organization invests money in tools, materials, and labor or production, and tries, through sales and advertising, to convince a sufficient part of the market that the product is worth buying. Without the rest of the organization, engineering would not be able to exist.

Extracted from a paper at the Natl Electronics Conference in Chicago

". . . purpose is to convince someone his product is worth buying. . . ."

It is easy to see that a big problem deserves careful presentation. However, it is just as important that proper presentation be made for very small jobs. Formal reports generally tell of the solution of the big problems, but informal reports, telling of the little problems, are just as important, and may be in the form of letters, memos, or even telephone or face-to-face verbal statements which are never written down. Even verbal reports are important, often affecting everyday operations, manufacturing processes, and even advertising and sales. The purpose of these reports reflects the engineer's basic problem—namely, that he convinces his customers to buy his product—that is, to act according to his recommendations.

FAULTS TO BE OVERCOME IN TRANSLATING REPORTS INTO ACTION

It is most important to realize the nature of the obstacles that must be overcome in translating the labors of an engineer or a scientist into action by others. Friar Bacon—prophet and martyr in the cause of science, who was persecuted, exiled from England, and cast into prison—came face-to-face with some of these obstacles in their most virulent form. In his book, *Opus Majus,* which tells of the fundamental importance of experimentation in science, there is this passage: "Now there are four chief obstacles that hinder every man, however learned, from grasping truth . . . namely, submission to ignorant authority, influence of customs, popular prejudice, and concealment of our own ignorance."

Perhaps today these are not as apparent as engineers' everyday problems. Mankind has progressed in its ability to direct the physical things of life, but it has always been by recognizing and working within the laws of nature. Frances Bacon has said, "For nature is not governed except by obedience." Like the physical laws, the nature of man has not changed, and the same obstacles are present as in the times of Friar Bacon. An engineer should know that his report will be received and interpreted biased by the background, environment, prejudice, and knowledge of its recipient.

The customer may be influenced by "authorities." In fact, it is human nature to "pass the buck" and lean heavily on authority. To meet this obstacle, the engineer should inspire sufficient confidence in the customer's mind so the engineer and his work are authoritative and worthy of acceptance, even though in conflict with previous ideas.

A true confidence in himself, derived from a thorough knowledge of his subject, gives the engineer the confidence of others. It will overcome many such objections as, "this isn't the way we have been doing it," "it won't work," "what we have is good enough" and kindred holdovers that are fetishes of less-enlightened authority. Aim to make the engineer's report of such a nature that it will instill in the customer, whoever he may be, confidence that here is a new authority. This sounds good, but it is not done in one fell swoop, without meeting and overcoming the problems on engineering and customer relations.

It is important that the engineer present his findings in a common language. This will enable one to overcome many prejudices. Too many people, often the engineer's customers, would readily subscribe to an old definition of the engineer:

> "An engineer is a person who passes as an exacting expert on the basis of being able to turn out with prolific fortitude infinite strings of incomprehensible formulas calculated with micrometric precision from vague assumptions which are based on debatable figures taken from inconclusive experiments carried out with instruments of problematical accuracy by persons of doubtful reliability and questionable mentality for the avowed purpose of annoying and confounding a hopeless chimerical group of fanatics referred to, all too frequently, as engineers."

This is supposed to be a joke, but all too frequently the definition borders on truth because engineers sometimes *do* act as though they are a world unto themselves, and give the impression that, if the engineer cannot convince people, he will certainly try to confuse them.

A careful attempt must be made to convey the information as simply as possible. It is not beneath the dignity of an engineer to give up some engineering language if it will serve to a better understanding. In setting forth an observation in common language, one of the basic concepts of physics was developed. About 1025 AD, a physicist of the Mo-

". . . avowed purpose of annoying and confounding. . . ."

hammedan culture invented the overflow method of finding the density of a body. Recognizing that others might be unfamiliar with Persian units of weight and measure, he expressed his result independently of units and introduced the idea of specific gravity—the ratio of the weight of a body to that of an equal volume of water.

Common language is a great aid in persuasion. It is easier for the customer to evaluate an engineer's work if the work isn't hidden in engineering verbiage. (Even engineers appreciate a simple presentation if, by its simplicity, it becomes easier to understand.)

One basic idea must be clear to the customer—that the work and recommendations are aimed to serve him. This is also a fundamental truth. Unless the customer can see the work is to his advantage, he will look elsewhere. Surprisingly enough, this is a two-edged sword; it works in both selling and buying. If an engineering department sets up more and more stringent requirements and expects to have these requirements met without adequate compensation, the suppliers lose interest in making the product. Also, if changes in a product are required which are different from the customer's stated desires, it is important to point out the advantages of the change to him, not that it makes the job easier for the engineer.

Fortunately the engineer does not often have to face the necessity of convincing the average person. His customers are specialized individuals and groups. Other engineers want to achieve certain results. Manufacturing wants to cut costs, save time, reduce the need for facilities, and eliminate undesirable conditions. Sales and advertising want to make their own jobs easier with a superior product, with special appeal, at lower costs. Management wants all these things at maximum profit. The engineer's problems as such mean little to his customer. Fundamentally customers are interested in what it will do for them such as saving money, time, or work; how it will enhance their prestige, or make life more enjoyable. In other words, the engineer tries to meet his customer's requirements. There is a poem called "Tell Me Quick And Tell Me True" by V O Schwab, which sums up these ideas:

I see that you spent quite a big wad of dough
To tell me the things you think I should know.
Now your plant is so big, so fine, and so strong;
And your founder had whiskers so handsomely long.
So he started the business in old '92!
How tremendously interesting that is, to you . . .
He built up the thing with the blood of his life?
(I'll run home like mad, tell that to my wife!)
Your machinery is modern and oh-so-complete;
Your "rep" is so flawless; your work is so neat.
Your motto is "quality" . . . capital "Q"—
No wonder I am tired of "your" and of "you!"
So tell me quick and tell me true
(Or else, my love, to hell with you!)
Less—"how this product came to be";
More—what the damn thing does for me!

". . . Management wants all these things at maximum profit. . . ."

Will it save me money or time or work,
Or hike up my pay with a welcome jerk?
What drudgery, worry or loss will it cut?
Can it yank me out of a personal rut?
Perhaps it can make my appearance so swell
That my telephone calls will wear out the bell;
And thus it might win me a lot of fine friends
(And one never knows where such a thing ends!)
I wonder how much it could do for my health.
Could it show me a way to acquire some wealth—
Better things for myself, for the kids and the wife,
Or how to quit work somewhat early in life?
So tell me quick and tell me true
(Or else, my love, to hell with you!)
Less—"how this product came to be,"
More—what the damn thing does for me!

A basic part of the engineer's philosophy should be this: an obvious difference of opinion about a problem can be resolved to everyone's advantage if all the facts are known and presented. All have heard of the Quaker meetings. In these meetings, there is never a vote. Facts and factors are presented until there is unanimous agreement. This procedure has much merit.

If differences of opinion arise during the "sale," it may well be that the engineer has not taken into account all the factors, some of which may be only human reactions, or that he has concealed his ignorance. Truly, ignorance either on the part of the engineer or the customer, is one of the chief obstacles to be overcome, and all possible means should be used in overcoming this obstacle.

A basic knowledge of the engineer's place in the order of things, and the realization that his developments are not mere reports but are useful to others in furthering the march of progress should be a source of genuine pride to the engineer. With the knowledge of the type of obstacles to be overcome, human reactions and the end results desired, he can develop his own philosophy concerning the engineer and the customer. This can and should become the lodestone in developing presentations so that his endeavors will be translated so as to satisfy some of the longings of humanity.

Cope Talks On

Draw Dies...VII

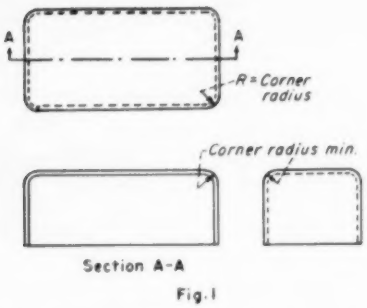


Fig. 1

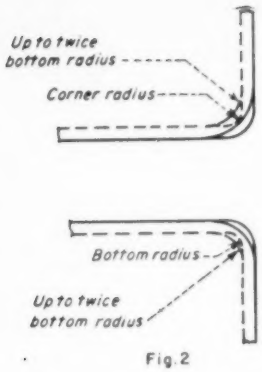


Fig. 2

FIG. 1 . . . Bottom radii at sides and corners of box should equal or exceed the corners, plan view. **FIG. 2** . . . Bottom radii at corners must be increased for thick stock or severe draws

YOU CAN DRAW RECTANGULAR SHELLS

Important design differences must be recognized for dies to make square and rectangular shells, as compared to tools for round shells. Since these matters are seldom discussed, at least adequately, in the literature on die design, Mr Cope's current instalment is a real service

BY STANLEY R COPE, President, ACME SCHOOL OF DIE DESIGN ENGINEERING

Square and rectangular shells can be drawn in one operation to a depth ranging from four to eight times the corner radius. Factors that determine maximum depth are:

1. Size of corner radii
2. Size of shell
3. Ratio between corner radii and length of flat portions of sides
4. Thickness of metal
5. Kind and quality of metal
6. Size of bottom radius
7. Width of flange
8. Shape of blank
9. Type of die
10. Type of press

The mean corner radius (center of stock) of a square or rectangular shell is the main factor in determining how deep the shell can be drawn in one operation. In order to draw a shell to its maximum depth in one operation, the minimum distance between the centers of the corner radii should not be less than six times the corner radius.

Maximum depth to which a square or rectangular shell can be drawn in one operation under the most favorable conditions is:

Mean Corner Radius In.	Depth of Draw times Corner Radius
0 to 3/16 in.	8
3/16 to 3/8 in.	7
3/8 to 1/2 in.	6
1/2 to 3/4 in.	5
over 3/4 in.	4

Ordinary drawing-quality stock may be used for drawing shells to one-half of the maximum depth possible. If a shell is drawn to one-half or three-quarters of the maximum depth, deep-drawing stock

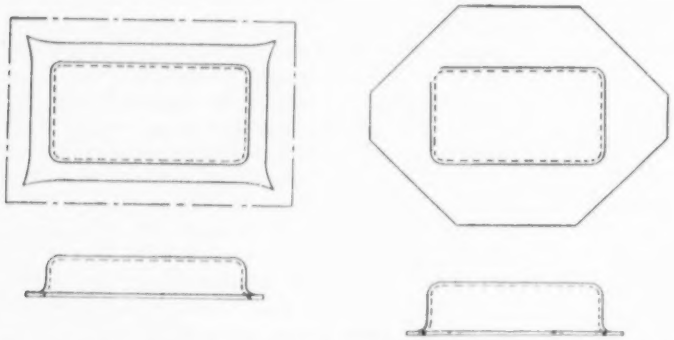


FIG. 3 . . . Plain blanks can be used to draw shallow shells with a depth not exceeding two corner radii. **FIG. 4** . . . to prevent tearing of deeper shells, the blank must be trimmed

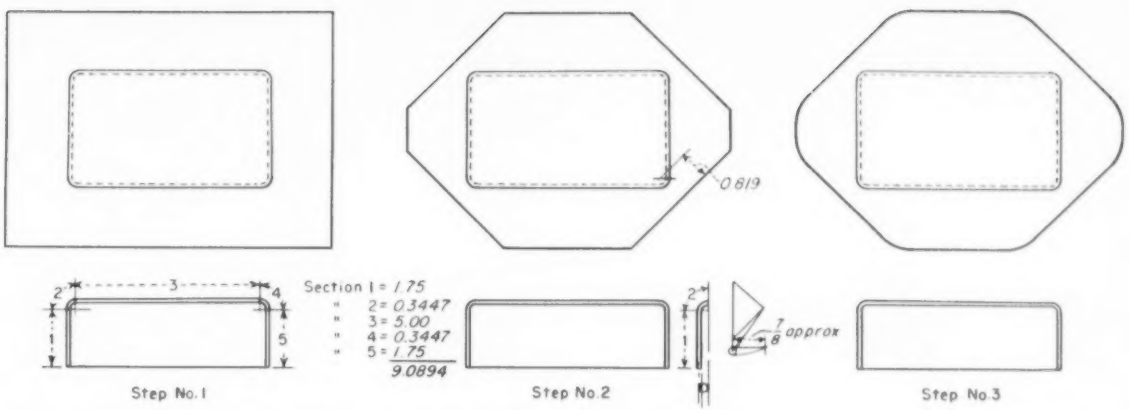


FIG. 5 . . . Use this approximate method to find the shape and size of blanks for wide shells having a width not exceeding the depth

BY FOLLOWING CERTAIN RULES

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should be used. Deep-drawing stock should also be used if the depth of the shell exceeds one-half of the width of the shell. Extra-deep-drawing stock is required to draw a shell to its maximum depth.

Unless the shell is very small it should not be made from metal less than 1/32 in. thick.

BOTTOM RADIUS

In order to draw a shell to its maximum depth the bottom radius along the sides and at the corners of the box, should be equal to or greater than the corner radius, Fig. 1. Greatest strain arises at the point where the bottom of the box meets the corners of the side wall to form a segment of a sphere. If the stock is thick or the draw is severe, it may be necessary to increase the bottom radius at the corners, up to twice the radius along the sides of the box, in order to prevent the metal from tearing, Fig. 2.

SHAPE OF BLANK

Square and rectangular shells may be drawn from plain square or rectangular blanks, or from blanks with trimmed corners or from developed blanks, depending upon the size of the shell; particularly its depth in relation to the corner radii. Very shallow shells, Fig. 3, whose depths do not exceed two corner radii may be drawn from plain blanks. If the depth of the shell exceeds two corner radii, the blank must be trimmed to remove the excess metal in the corners, Fig. 4. Otherwise, the shell will tear at the corners. Under favorable conditions shells may be drawn from trimmed blanks to a depth equal to four times the corner radius.

In order to draw a shell to its maximum depth the blank must be developed with all excess metal removed, Fig. 5, in three steps:

STEP NO. 1. Lay out the front and top views of the shell and find the width and length of the blank. Ordinary bending formulas are used.

STEP NO. 2. Lay out one-half of a round shell with a diameter equal to twice the corner radius of the rectangular shell and find the radius of the blank by the graphical method. Draw 45° lines across the corners of the blank which measure a distance equal to 0.9375 times the radius of the blank from the center of the corner radii.

STEP NO. 3. Set your compass to a radius equal to the distance between the center of the corner radii and the edge of the blank and draw arcs which are tangent with the straight side of the blank and the angular corners.

This method of developing blanks is satisfactory for finding the approximate size and the shape of blanks for shells that are comparatively wide and whose depths do not exceed the width of the shell. When a shell is narrow, or it has a depth greater than its width, the arcs at the corners of the blank form a point and cannot

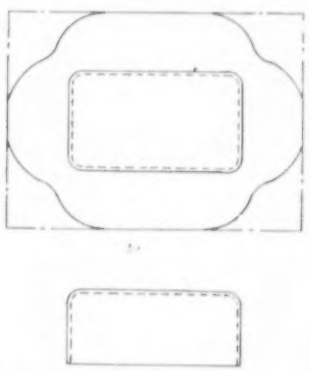


FIG. 6 . . . To distribute metal in the blank for a narrow shell, or one deeper than wide, lay out the corners and reduce the length

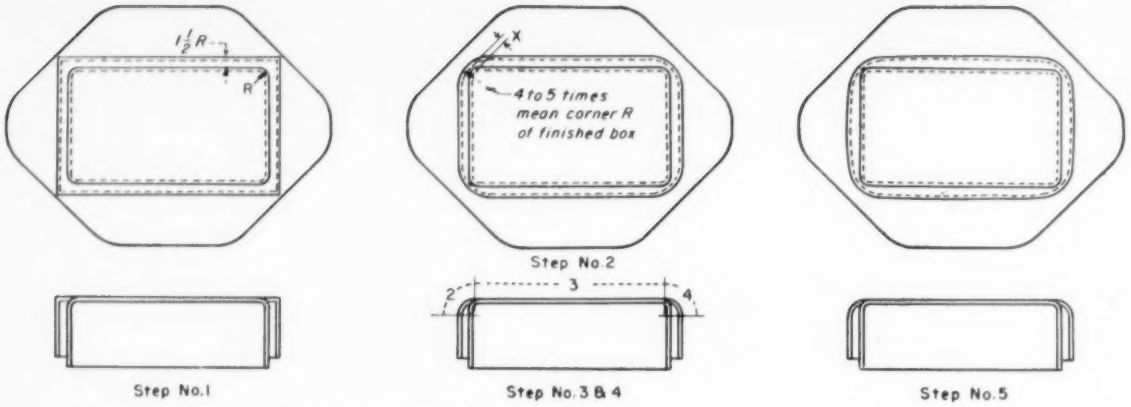


FIG. 7 . . . If a shell cannot be made in one operation, follow this sequence of steps to find the height and shape of the first-operation shell

be drawn tangent with the straight ends and angular corners of the blank. Blanks of this type cannot be used because the area of the blank is less than that of the shell. In order to make the areas equal, and to distribute the metal in the blank properly, it is necessary to reduce the length of the blank slightly and lay out the corners similar to those in Fig. 6.

Square shells are developed in the same manner as rectangular shells. Frequently, depending upon the corner radii and the size and the depth of the shell, it will be found that the blank for a square shell closely follows the circumference of a circle. When this condition exists, a round blank should be used.

Blanks should be developed in the die room, with sufficient metal at the corners to allow the corners of the shells to draw considerably higher than the sides. The corners of the die wear more rapidly than its sides. If this precaution is not taken, the shells will become short at the corners after a few hundred pieces have been drawn, and insufficient stock will be left for trimming.

FIG. 8 . . . Oblong shells with round ends are difficult to produce, because the ends must be drawn

FIRST-OPERATION SHELLS

When a shell cannot be drawn in one operation the size and the shape of the first-operation shell can easily be found by following the steps shown in Fig. 7.

STEP NO. 1. Multiply the mean corner radius of the shell (center of stock) by 3 and make the new shell this much wider and longer than the finished shell. This rule applies only to shells which have corner radii less than ½ in. For ½ in. and larger corner radii, the new shell should be ¾ in. larger on each side for all sizes. These rules may have to be modified if the corner radii of the shell are large in relation to the width and length of the shell.

STEP NO. 2. Draw the arcs in the corners of the shell, using a radius equal to about five times the corner radii of the finished shell. Distance *X* should be about ⅛ in., although it may vary depending upon the shell size. If this distance is too large there will be a proportionately large reduction at the corners, making the drawing operation more difficult. If this distance is too small, the draw collar will be weak at the corners and may break.

STEP NO. 3. Draw the arcs in the bottom of the shell in the front sectional view. It is general practice to make the inside radius equal to the amount the shell is reduced on one side plus one-quarter of the bottom radius of the finished shell.

STEP NO. 4. Compute the length of the straight portion of the side of the box, by subtracting the sum of sections 2, 3, and 4 from the length of the flat blank and dividing the difference by two. Draw the height to scale.

STEP NO. 5. Curve the sides of the shell slightly to make the sides draw instead of simply "flapping" into place during redrawing. This procedure helps to prevent flowing of the metal from the side of the shell into the corners. If such flow occurs the excess metal causes the corners of the die to lead and shells to be scratched and torn.

If the corner radii of a shell are very small, or the shell is very deep, more than two operations may be required.

Square shells and small rectangular shells that cannot be made in one or two operations are usually redrawn from round shells. The shell is first laid out as any ordinary rectangular shell which is to be produced in two operations. A round shell is then laid out, which, when reduced to the rectangular shape, will undergo a

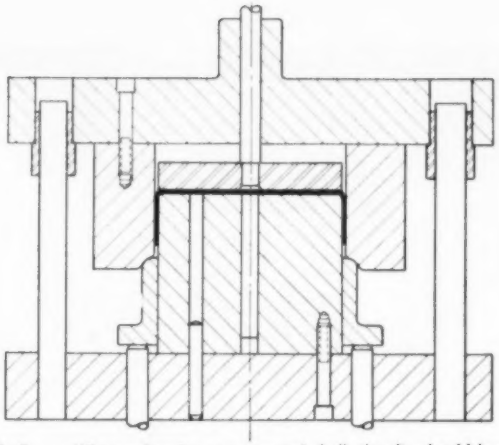


FIG. 9. . . . When redrawing a non-round shell, the die should have a drawing collar with a rounded edge to prevent the shell from drawing more rapidly at some portions than others

Fig. 10

Fig. 11

Fig. 12

FIGS. 10 AND 11—If shells have small flanges, or are to be trimmed by the wipe-down method, they are made as shown. FIG. 12 . . . Wide-flanged shells are redrawn over dies with rounded corners

reduction of 12, 15, or 20%, according to the stock thickness. Height of this shell is computed by area. The number of dies required to produce the round shell is determined by the percentage method.

Frequently shells are oblong and have round ends, as shown in Fig. 8. These shells are more difficult to draw than ordinary rectangular shells, because the ends must be produced entirely by drawing instead of a combination of drawing and bending. The number of operations required to produce a round-ended shell depends upon the size of the shell and the relation between its width and length. The wider and longer a shell the easier it is to draw it. Short shells, or those which have small straight portions between the rounded ends, are very similar to round shells, use same operations.

Under ordinary conditions it is not advisable to draw a round-ended shell to a depth greater than 1½ times its corner radius in one operation.

DESIGN OF DIES

Square and rectangular shells may be drawn in either single or double-action presses. It is common practice to blank and draw small- and medium-sized shells either in combination dies or in double-action dies, depending upon the type of press available. Larger blanks are produced separately and are drawn in plain drawing dies.

REDRAWING DIES

Square, rectangular and other non-round shells should always be supported inside by a collar during redrawing. Single-action and double-action dies are suitable for this type of work.

The single-action die Fig. 9 is constructed similar to those used for redrawing round shells. The die differs from an ordinary redrawing die, however, in that the shell is reduced over rounded corners instead of flat angular corners. Angular corners are used for redrawing round work only. The drawing die is machined to fit around the rounded corners at the bottom of the shell. This feature is important when redrawing non-round work, to prevent certain portions of the shell from drawing into the die more rapidly than other portions.

If shells have small flanges, or if they are to be trimmed by the wipe-down method, they should be made as shown in Figs. 10 and 11. Wide-flanged shells must be redrawn over dies with plain rounded corners, Fig. 12.

DRAWING RADIUS

The drawing radius in the die hole of a square or rectangular die should be the same as that used for drawing a round shell of the same metal thickness. The size of the drawing radii for first operation dies is more important than the size of the radii for redrawing dies. Under favorable conditions the drawing radii of redrawing dies may be as small as one-half of those used for first operation dies.

The same size radius is usually machined around the entire periphery of the die. In some cases the radius is made smaller in some places to retard the flow of metal in certain areas. For example, if the sides of a box flow in too rapidly, the radius along the corresponding sides of the die is made smaller than the radius of the corners. This regulates the flow of metal.

DRAWING CLEARANCE

Square, rectangular and other non-round shells which are ordinarily made in one operation may be drawn metal-to-metal. Some diemakers prefer to make the straight portions of the die metal-to-metal and allow a little more than one metal thickness at the corners to reduce the strain on the shell and the pressure required to draw it. Another advantage of extra clearance in the corners of the die is that the shell is stronger because the metal in the corners of the shell thins out less.

Extra space is also advisable in the final die of a series of dies. When a shell is reduced the metal tends to thicken at the corners.

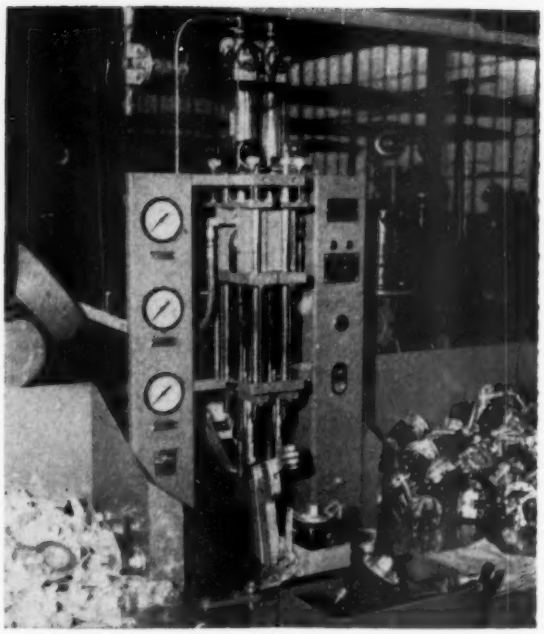
First-operation dies and other preliminary dies should have a space between punch and die, all around, equal to 1.1 times the stock thickness.

Part VIII of Mr. Cope's series will appear in an early number.

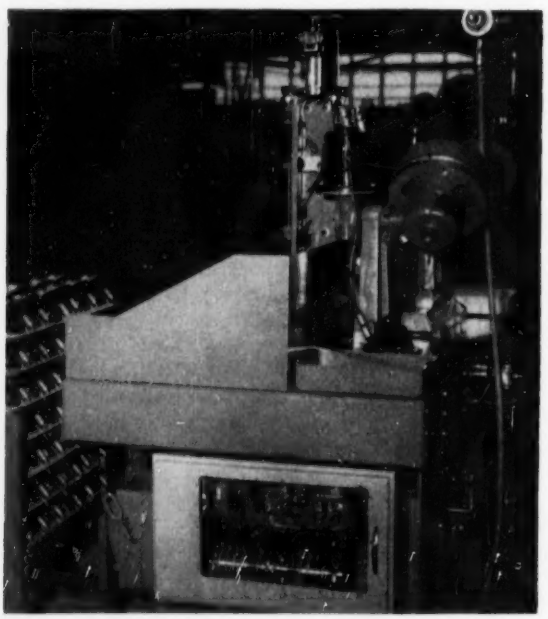
300% Production Gain With Automatic Screwdriver

Operator fatigue, hence turnover, plus a high rejection rate, made this simple assembly operation one of the most costly in the plant. Then tool engineers designed a "super-screwdriver," cam controlled to hold the components automatically and positively drive six screws. With normal speed, an operator now can assemble four times as many switches per hr, fatigue has been reduced, and rejects from cross-threading are eliminated

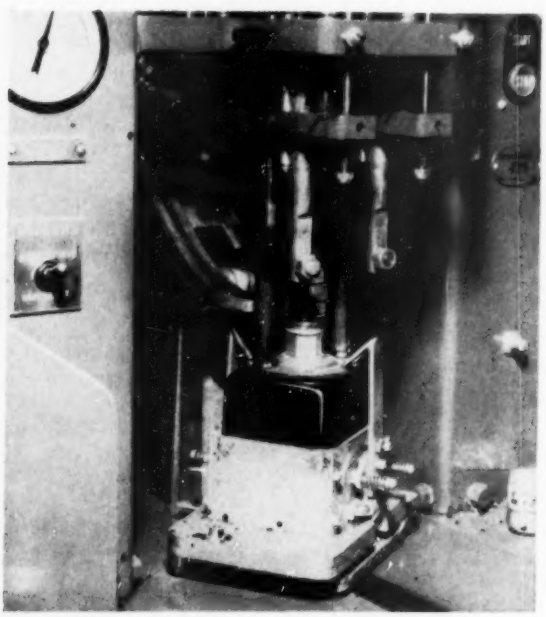
BY HENRY J McCORD, Production Engineer
FURNAS ELECTRIC CO, Batavia, Illinois



SUPER-SCREWDRIVER consists of table and operator control panel, two hoppers, screw feed chutes and escapements (controlled automatically), two Thor power screwdrivers, air clamp, indexing table, rotating cam sequence switch, and a signal bell to indicate when hopper is empty or when screw jams in chute. Operator sits in front of machine; components are arranged in order of assembly within easy swing of both hands



CAM-TIMED SEQUENCE SWITCHES start and stop each of the operations, driving and indexing the assembly jig to each of its positions. Screws slide down track from escapement to screw-holding fingers which position them for driving. It takes only a few seconds to drive all six screws. At conclusion of third index, fixture is returned from under drivers and cleared of finished switch. Two screw feed systems each provide three screws per cycle



COMPONENTS ARE PLACED together in holding jig; two removable dowel pins locate respective holes, one above the other, with tapped holes of switch frame at bottom. Operator then presses two buttons (one with each hand, for safety) and holding fixture moves, by power, under automatic screwdrivers. Air clamp presses down on nut to hold components together in position for assembly, and spring-loaded nest holds switch against case from inside

ROUND TABLE

Too Old to Learn?

"I see by the bulletin board that you got cut out of that vacation jaunt up to State University, Ed. They must think you old goats are too set in your ways to learn anything."

"What's all this, Al? I thought everybody was going to go to that supervisory course."

"Nobody over 45, Ed. I asked Harrison about it, and he said Johnson pulled a fast one and got the rule adopted when he wasn't looking. I suppose it doesn't matter much, though . . . "

"Of course it matters! What the hell is the matter with Johnson? Just because I'm over 45 doesn't mean I can't learn. . . . In fact, I was reading in the paper just a couple of days ago about a study some college made that proved just that point."

"Well, Harrison claimed Johnson kept putting up good arguments until he had to give in. The one that clinched it, though, was that they can't spare any of the experienced foremen."

"They can spare them in hunting season, Al. It's only for two weeks. And besides, if they think their experienced foremen are so stupid they can't learn, how come they let them run departments? How come I wasn't fired nine years ago?"

"I don't know, Ed. Oh, I suppose it would take a little longer for older men to grasp the ideas in the course. Maybe that's the trouble. Johnson probably thinks the older men would hold back the younger ones."

"Nuts to that, Al. The courses only have 15 men apiece, so there's plenty of individual attention. And the courses are designed for anyone from 18 to 60. Why didn't Harrison put up a fight? It's his pet project, isn't it?"

"Yeah. He was all enthused when the first group came back and bragged about how they learned so much. Maybe he's just losing interest."

"I'm not surprised at Johnson; he's an old shop man, and he doesn't care beans for formal education; but I thought Harrison would really put it over."

"Maybe he got tired of fighting, Ed. It's tough to get progressive ideas across in an old plant."

"Well they got the idea across—it's this kick in the face to foremen over 45 that bothers me, Al. It's not right. And it sets us on the bench in the minds of boys who get to go."

IS ANYONE TOO OLD TO LEARN, *or is that one of those exploded myths? Can an old-line foreman get education, or is he usually too set in his ways? Your ideas on this subject may prove interesting to other readers. Discussions of earlier topics appear on later pages.*

Special Flanging Machine Avoids Tying Up Large Press

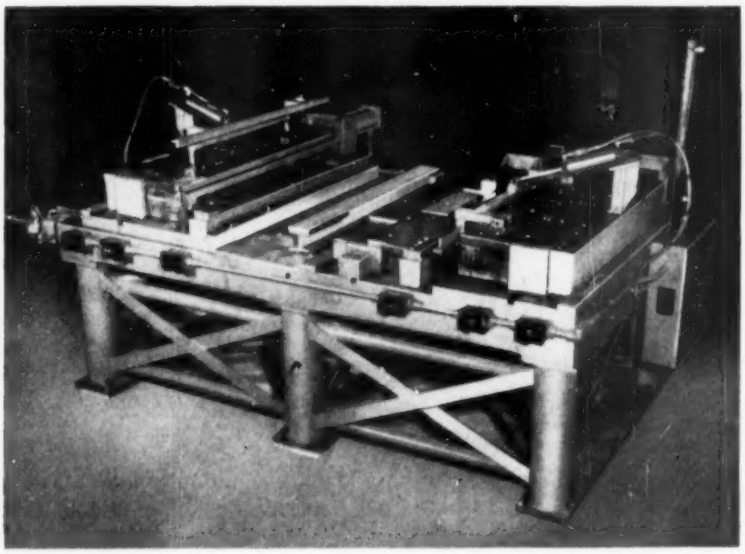
We are so accustomed to think of a complete press line for a mass-production product that we often overlook the cost-savings potential of a special machine on a second operation

By RALPH GUESS, Chief Engineer
VULCAN TOOL CO., Dayton

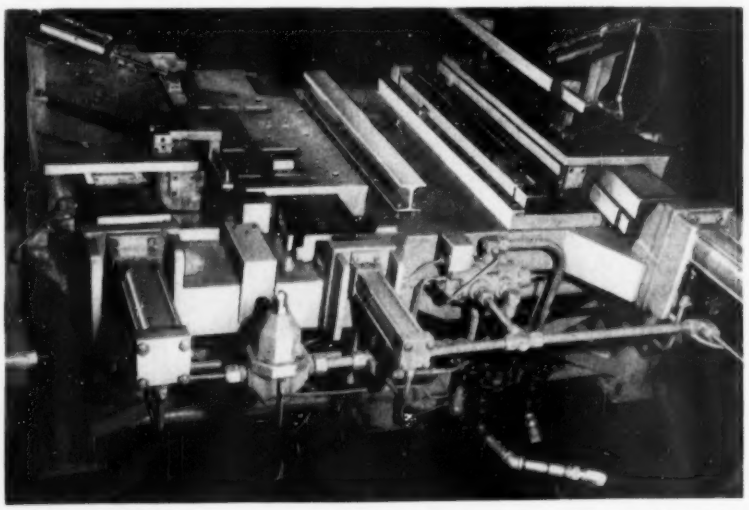
Liner skirts for refrigerators are normally produced on three large presses. Typical operations are: (1) blank and pierce, (2) form four sides of the liner skirts, and (3) form a return flange on two edges. At Hotpoint, Inc., liner skirts are required in two widths and four lengths. By normal procedure in the refrigerator industry, each size of skirt would be flanged in a cam die. Four sets of dies would be required, and these would have to be changed each time a different size of skirt was run.

Because the flanging operation ties up a large press, and cam dies are expensive, Hotpoint engineers conceived the idea of a special flanging machine that could readily be adjusted to any size of skirt liner being run in production. Such a machine would have the advantage of much lower cost than a press, and it could be placed anywhere that would be convenient. The big press could then be released to other work.

Hotpoint turned to us for the flanging machine, because, as a member of the National Tool & Die Manufacturer's Association, we build special equipment for the stamping trade, in addition to dies and tools. The machine was built, tried out and shipped several months ago.



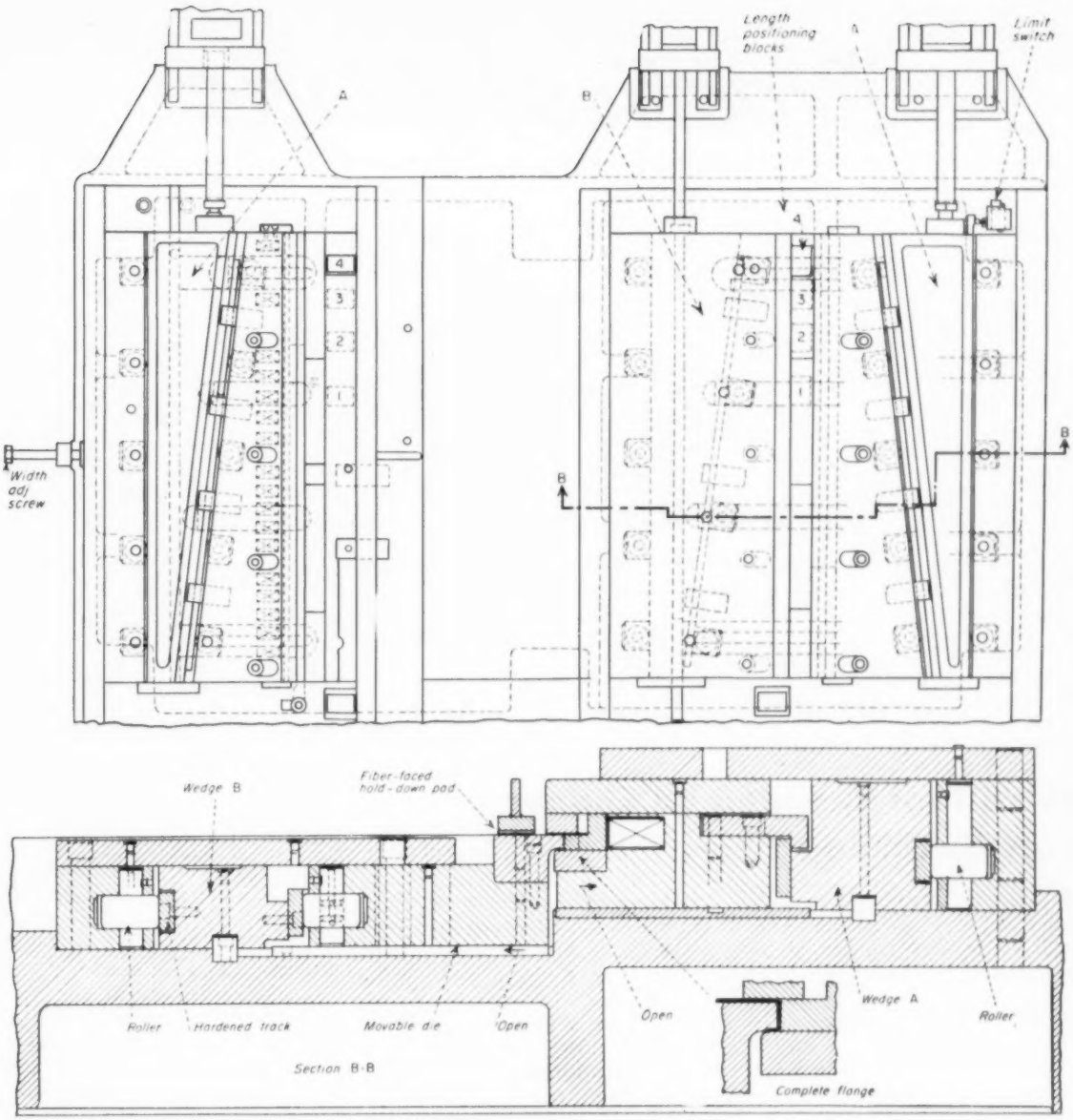
OPERATING STATION of machine is accessible so that operator can load and remove liner skirt with minimum effort. One panel clamp is up, the other is in clamping position



HYDRAULIC CYLINDERS for cams and hydraulic piping are arranged for easy servicing. Pump and oil sump are placed in separate compartment

One man can operate the flanging machine, which is capable of a 7 sec cycle, as compared with a press that makes only 6 to 7 strokes per min. Cost of the unit equals that of about 1½ cam dies, thereby saving the expense of 2½ sets of cam dies. Changes can be quickly made in setup of the machine for any of the four different liner skirts. Production interruptions as when changing cam dies are avoided.

Action of the quarter-return



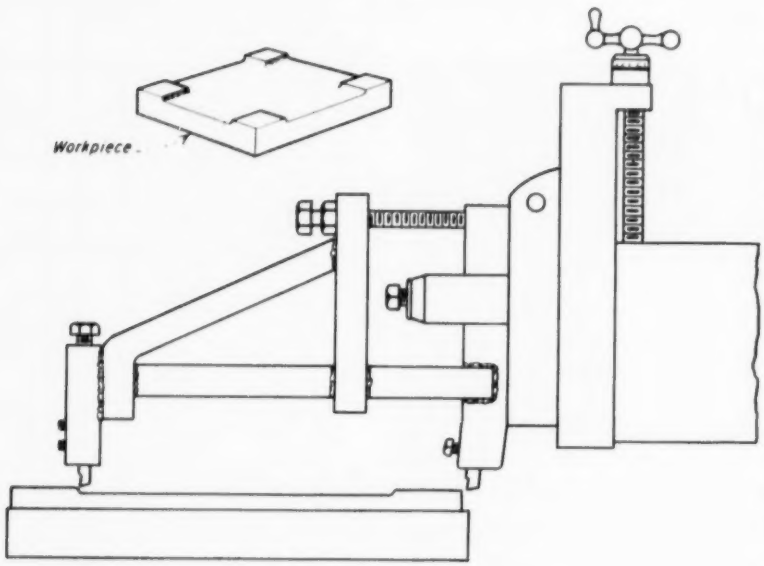
CAMS *A* act together to form under the 90° bends on opposite edges of the panel. Cam ***B*** unlocks the finished panel, by allowing spring pressure to return the sliding die element to dwell position at left

flanging machine is derived from three hydraulically operated wedges or cams. The two outer cams *A* bend under the 90° bends on the sides of the panel. Next a movable section of the die is collapsed by withdrawal of the central wedge cam *B*. Note that these cams operate against heavy rollers, and that the rollers bear on hardened tracks.

Operation of the machine is as follows: The panel is laid with formed edges down onto the die elements on the machine bed, and is located by length positioning blocks 1, 2, 3 or 4. By tripping a pushbutton, two hydraulic clamps with fiber-faced pads press down the edges of the panel to hold it down and take out any warp or buckle that may be present. This step insures that the flanges will be properly formed. Cam *B* now moves in to push the sliding element of the die to the right to forming position. Next cams *A* move forming punches inward to form the flanges. When right-hand cam *A* has reached its innermost travel, it trips a limit switch that causes return of cam *B* to out position. This action unlocks the panel as the cams *A* retract. The operator removes the panel and places a new one in position.

Stationary die elements at left of the machine can be placed in either of two positions, depending on width of panel being run. A screw adjustment repositions the forming punch and left-hand cam *A*. Positioning blocks 1, 2, 3 and 4 are used, according to the length of panel.

Practical Ideas

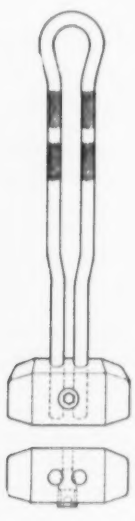


Extra Tool Mounted on Shaper Cuts Machining Time

We recently received an order which called for machining off four pads on a large number of cast iron plates. The plates were a little too wide to clean up in one setup on a milling machine, so, as a first attempt, we strapped them down in gangs on a planer. Even with rapid crossfeed, to cover the area between rows of pads, the tool was cutting air for most of the stroke.

To avoid this, we put them in the shaper and made a double toolholder. It consisted of a standard toolholder, to which was welded a slotted piece of round stock. The other parts are made of ¾ x 2 in. flat stock, welded together as shown. A screw at the top of the toolholder butts against the holder and takes the spring out of the assembly.

A toolbit, locked with setscrews, is mounted at the end of the unit and backed up with an adjusting screw. The two cutting tools are lined up by putting a length of flat stock in the vise and setting up the tools to this stock. Then, with the double toolholder we spent very little time cutting air.
Henry Gifford, Bronx, NY



Copper Hammers Easily Reconditioned

It is often necessary to recondition, either anneal or machine off worn areas, of copper-head hammers. The design shown (left) makes this a very easy task.

The head of the hammer is made of round or square bar stock with two holes drilled through for the loop ends. These holes are drilled slightly oversize with a ¼-in. land between the holes. The steel hook which serves as a handle is secured to the hammer head with a tough setscrew, which has a long tapered end which jams between the two legs. Two notches in the steel handle help fasten the screw securely.
N Palmer, N S W, Australia

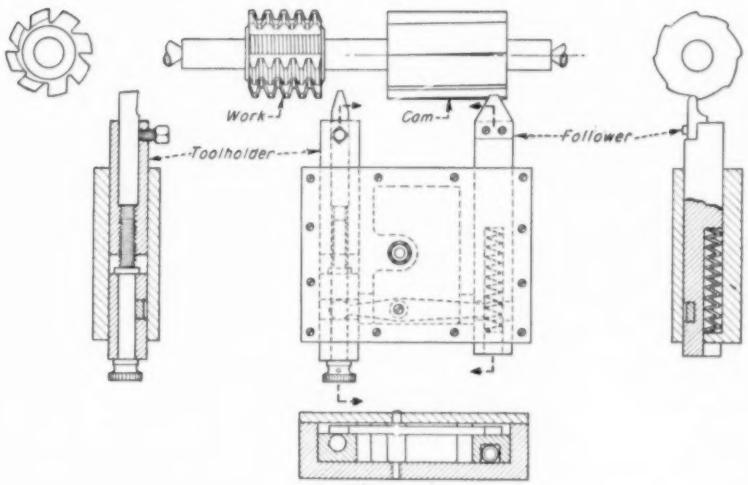
Machine Alterations Turn Lathe Into Threadmill

Production was more than doubled when we converted a turret lathe to do the work of a threadmill. The changes were quite simple.

First, we mounted a tapping machine reverse-switch on the bed of the turret lathe. Two fingers, spaced for the depth of the tapped hole, were added to the hex turret compound slide, and the 3½-in.-diameter tap was mounted in the turret.

The high-speed coil of the lathe motor was wired to reverse the motor when the reverse switch was tripped by the finger on the compound slide. The low-speed coil of the motor was wired so that, when the tap was withdrawn, the motor was operated at low speed, ready for tapping.

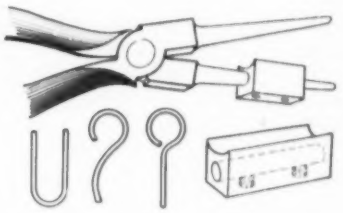
The work is mounted in the chuck, and the compound is moved forward to engage the tap. When proper depth is reached, the reverse switch reverses the motor into the high-speed coil, and the tap is rapidly removed from the work.
James E Melton, Independence, Mo



Simple Attachment Relieves Hobs on Lathe

This attachment, designed for relieving a hob on the lathe, is very easily made. The base is bolted to the toolpost of the compound rest. On top of the base are two grooves which slidefit the toolholder and follower. A cover plate holds the toolholder and follower in place. The position of the toolholder can be adjusted in or out with a knob and screw. The bar, acting as a lever on a pivot, connects the toolholder and follower as shown. A hob-like cam, identical in form with the hob, is pressed onto the mandrel.

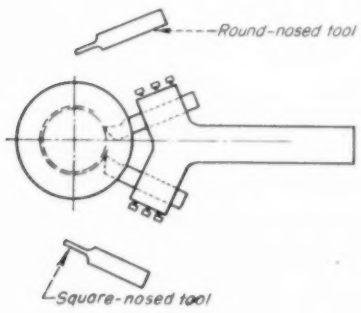
The distance between the cutter and the cam is limited by the toolholder and follower in the attachment. A compression spring holds the follower firmly against the cam. When the lathe is running, the toolholder will move in and out according to the cam form. The lead angle of the cam and the setting of change gears for relieving the cutter should be the same as when cutting the hob. *S C Chang, Taichung, Taiwan, China*



Round-Nose Pliers Make Handy Forming Tool

Simple steel or brass blocks made as shown fit over round-nose pliers, converting them into a handy wire-forming tool.

A suggested way to make the block might be to take a piece larger than necessary, and drill and ream a hole whose radius is the desired curve. Splitting the block down the middle along the axis of the hole will give two similar blocks. *Wm Adams, Bayside, N Y*

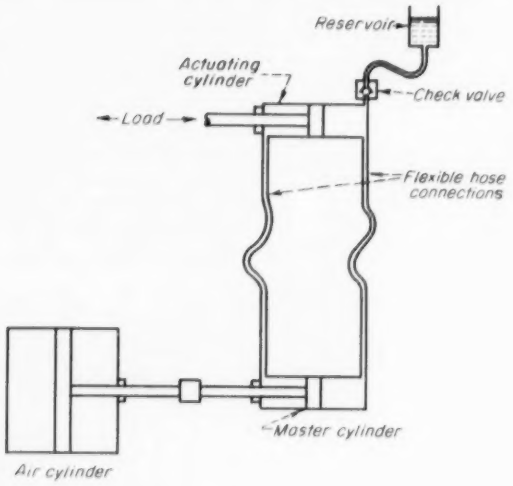


Double Toolholder Saves Tool Wear

We recently received a job which called for cutting a large number of grooves 1 in. deep on 4-in.-dia steel shafts. We started doing the job with a regular parting tool. This tool did the job but it required a great deal of grinding. The chip produced when cutting with a parting tool is actually wider than the tool because the metal spreads out as it is removed from the shaft. This results in high pressure and rapid erosion of the top surface of the tool. Also, the corners of the tool dull rapidly because there is very little metal behind them to conduct the heat away.

This job was such that a radius at the bottom of the groove was acceptable, so we tried a round-nosed tool. This tool cut a curved chip. As the chip rubbed over the top of the tool, it tried to straighten out and get wider. This resulted in binding in the groove and heavy pressure on the tool, causing chatter.

We solved the problem by using each tool to its best advantage. We made up a toolholder as shown. The round-nose tool is slightly narrower and cuts slightly deeper than the square-nose tool. The round-nose removes most of the stock, and the square-nose trims the sides. The chip from the round-nose is now narrower than the slot because the square-nose tool widens the slot to size and makes two narrow chips which discharge readily from the slot. *Jack Dalton, Bronx, N Y*



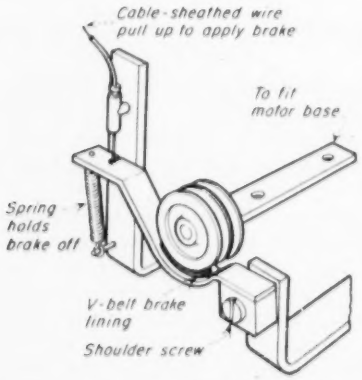
Air-Hydraulic Actuator Saves Installation Space

Sometimes an actuating force is needed on an air-controlled machine, but a direct mechanical connection between the air cylinder and the load is not practical; (air systems are generally low-pressure as compared with hydraulic systems, and when the force requirement is large, there may not be room for the required air cylinder). An air-hydraulic system such as the one shown was used on one of our machines, with the small hydraulic actuating cylinder mounted on the tool slide, on a moving carriage, providing substantially the same force as the large air-cylinder mounted in a convenient position on the bed of the machine itself.

The actuating cylinder and the master cylinder are identical and are hydraulically symmetrical—piston-end to piston-end. The stroke of the air-cylinder is just a little greater than the travel between positive stops of the actuating cylinder. This insures a full-length positive stroke every time, wherever a continuous force is not required at either end of the stroke. Thus the actuator should work through a cam or some linkage which is stable at both ends of the stroke.

The reservoir is positioned as shown and connected to the hydraulic system through a ball-check-valve which compensates for leakage, avoids air bubbles, and insures reliable operation for long periods of time without attention.

Essentially the system is the same as any other externally energized hydraulic system—for example, the hydraulic brakes of an automobile. It differs from others I have seen in the means used to obtain a positive constant-link, constant-pressure stroke, in spite of oil leakage past the packing glands or pistons. *Oliver Sarri, Schiller Park, Ill*

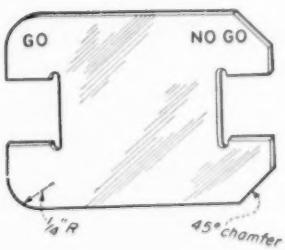


Hand-Brake for Fractional-hp Electric Motors Saves Time

This inexpensive hand-brake can be fitted to any small motor, and is especially applicable to operations where the motor must perform a large number of short cycles. Time wasted waiting for the motor to stop between cycles can be a considerable factor in such cases.

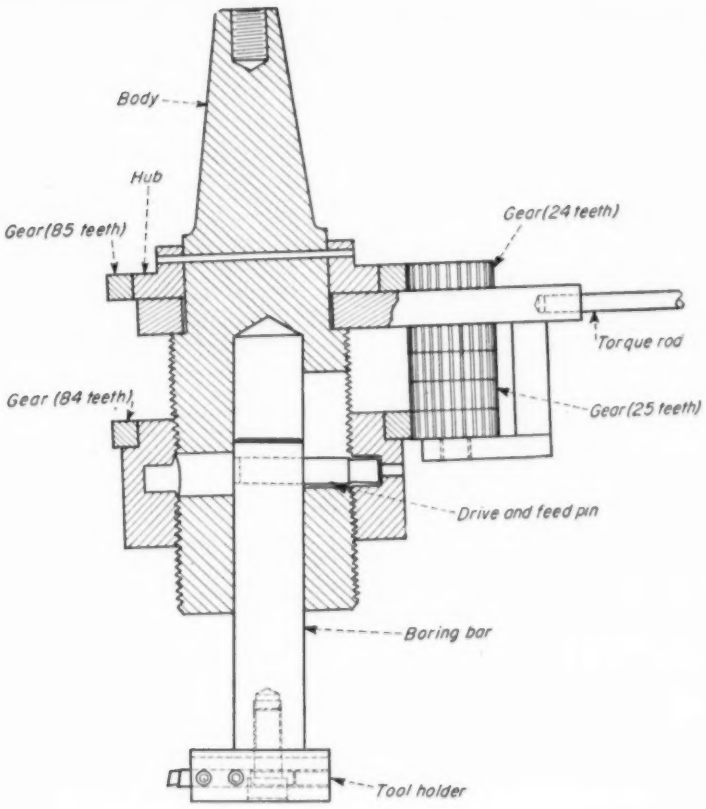
Two support blocks are designed to fit the existing feet of the motor. Then a pulley with an extra V-groove (to accommodate the brake lining) is put on the shaft of the motor, and the motor is mounted on the support blocks. The brake shoe is held in place with a large shoulder-screw, which provides a sliding surface for the shoe. The brake lining is riveted to the brake shoe.

The simplest brake lining is a short piece of V-belt, of the same size as that used to drive the motor. If desired, the lining could be formed from typical asbestos-filled material. *G Lee, London, England*



Radius and Chamfer Identify Go, No-Go Gage Ends

We have recently started to put a radius on the "go" and a chamfer on the "no-go" end of our snap gages. With this construction, the user of the gage can easily differentiate between the two ends without looking for the stamped note on the gage. *F C Elmo, Dayton, Ohio*



Unusual Boring Head Provides Jig-Bored Angular Die Relief

We do quite a bit of die work, in which our usual method for providing relief for jig-bored holes was to chuck the work in a lathe and cut the relief portion of the holes. This required a lot of time, especially when the die block was large, because each hole had to be picked up with an indicator, and, when the hole was near one end of the block, it meant using a large lathe and balance blocks. To save time on this work we built an angular boring head. It consists of a steel body with a shank turned to fit the jig-borer. (It could have been made to fit a vertical miller.)

The body of the tool is threaded on its OD and bored to make a sliding fit on the boring bar. This hole for the boring bar is bored at the required relief angle with the centerline. We used an angle of 1½°, which is satisfactory for most of our work.

The boring bar has a cross-pin pressed in near the top end. A feeding ring is threaded on its ID to fit the body. The inside of this ring is grooved to fit the feeding pin. A key is milled on one end of the boring bar, and a toolblock is keyed and screwed to the end of the bar.

A tool bit is clamped in this block and backed up with a setscrew. A bronze bushing is pressed into an arm and bored for a running fit on the body. An 85-tooth gear is pinned to the body above this arm, which also carries a jack shaft running in bushings. One 24-tooth gear is keyed to the top of this shaft and four 25-tooth gears (all alike) are keyed to the shaft with teeth in line. A final 84-tooth gear is pressed onto the feed ring. A torque rod is fitted to the arm and rests against the jig-borer column which prevents the arm assembly from rotating.

As the spindle rotates, the 85-tooth gear drives the 24-tooth gear, which, in turn, drives the 25-tooth gears through the jack shaft. The 25-tooth gears drive the 84-tooth gear, which drives the feed ring.

We have:

$$\frac{85}{24} \times \frac{25}{84} = 1.054$$

Thus, for every revolution of the spindle, the feed ring rotates 1.054 revolutions, or 0.054 revolutions more than the body. With 12 threads per in., which we used on the tool body, the boring bar feeds:

$$0.054 \times 1/12 = 0.0045$$

or 0.0045 in. per revolution. Of course, the vertical feed on the jig-borer or milling machine is not used with this tool.

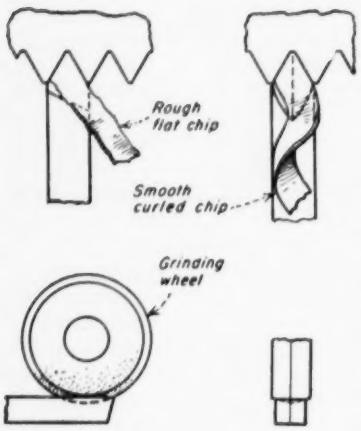
In building the tool, we used ⅜-in.-face "change" gears because they are available from stock with any number of teeth from 20 to 120. Other gear combinations can be effective with suitable tool size.

Notice that the feed pin rides in a slot in the tool body. If the operator fails to stop the spindle before this pin reaches the end of the slot, the tool will jam. To prevent this trouble, we made the torque rod from a wooden dowel. If the pin should accidentally strike the end of the slot, the dowel breaks and prevents damage to the tool.

We have made up a number of toolholder blocks to suit various diameter holes.

After each cut the tool is fed out with the backup screw. For fine adjustment of the hole size, the machine table is lowered, or the spindle is raised. Each 0.100-in. movement of the table or spindle is equal to 0.0013 in. tool feed.

Clifford Molloy, Bronx, NY



Special Tool Grind Saves Threading Time

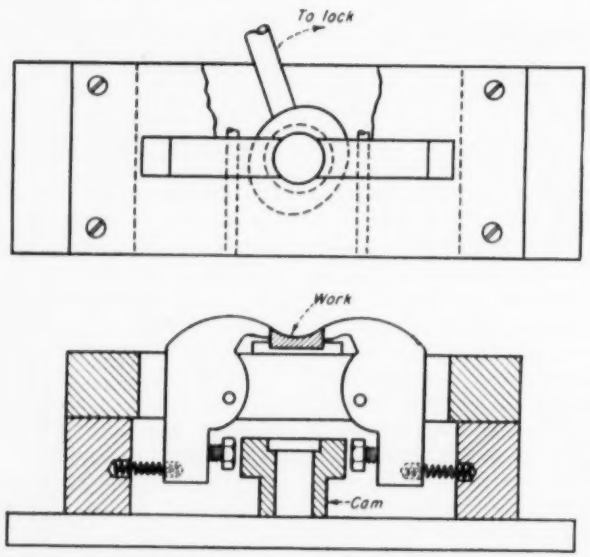
In cutting threads on the lathe with conventional single-point threading tool with straight top-rake, the chip bears hard on the crest of the thread. causing a burr and friction, overheating the work and burning the tool.

We do a great deal of threading on the engine lathe, especially on special fittings and screw spindles for valves. I have found that by using a special chip-breaker on the threading tool, as shown on the sketch, a lot of the above trouble is eliminated. With this kind of tool-grind threads can be cut by feeding straight in or at an angle; also either left- or right-hand threads can be made with the same tool. I have cut a 4-pitch thread with a single step.

The sketch shows a ⅜-in. tool-bit ground with a 3-in. wheel with a ½-in. face beveled each side of the center at about 12°. The effort spent in grinding this tool has paid off with good results. Under normal use the tool can be resharpened many times before a new tool is needed.

Before writing this I searched through quite a bit of literature on this subject and could not find any reference to this method of grinding. *N H Nixon, Sebring, Fla*

Cam-Action Milling Fixture:



MILLING FIXTURE, originally made for holding small washers, since used with different jaws for several jobs. Chief advantage of the fixture is that the jaws, being pivoted, close in and down, making for rapid loading and unloading. The cam, jaws, and adjusting screws require casehardening. *F W Brown, London, England*

WINNER NO. 188
OF
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In Sept 28, 1953 Issue

WALTER HOLMES
MINNEAPOLIS, MINN

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for the best PRACTICAL IDEA

An extra payment of $25 is made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

PAYMENT—$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of issue. The winner will also be announced in these pages as soon thereafter as practicable.

JUDGES—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in a tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

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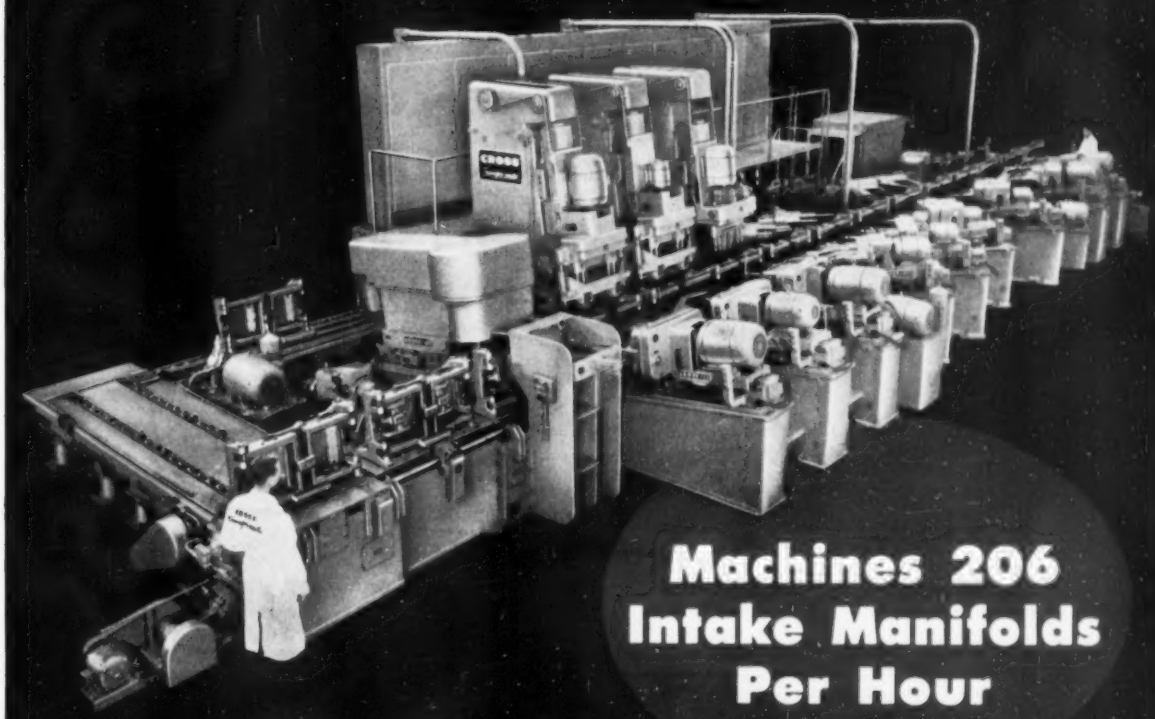
WHO MAY ENTER — Anyone may enter except employees of the McGraw-Hill Publishing Co, Inc, and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER—Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42nd St, New York 36, N Y.

Another Transfer-matic by Cross



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- ★ 100 operations—two milling, 48 drilling, four boring, 20 chamfering, four spotfacing, and 22 tapping.
- ★ 14 stations—one loading, one unloading, 12 working.
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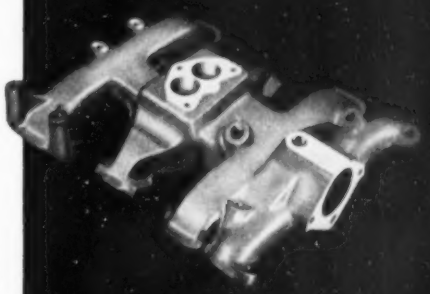

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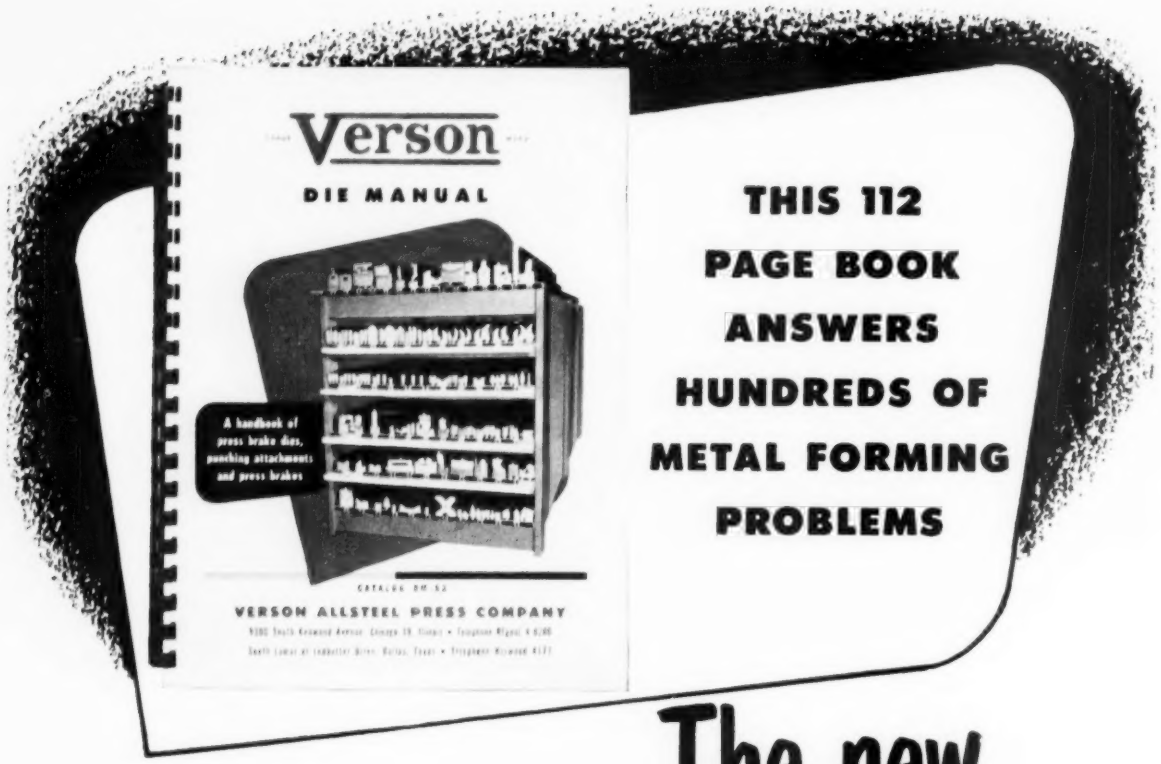

THIS 112 PAGE BOOK ANSWERS HUNDREDS OF METAL FORMING PROBLEMS

The new Verson DIE MANUAL

DM-53

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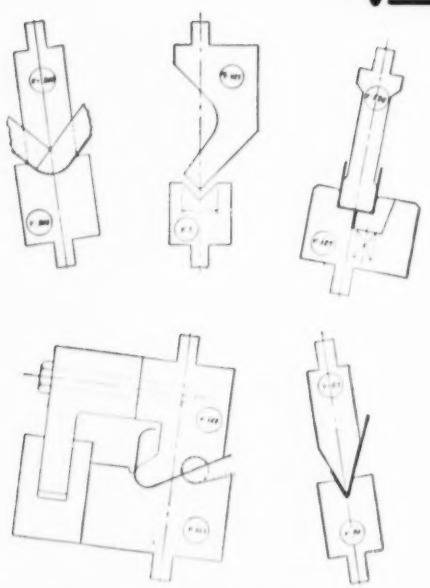

JUST off the press, the new enlarged Silver Anniversary edition of the Verson Die Manual contains 112 pages devoted to a pictorial presentation of Verson press brake dies and special tooling along with detailed text and tables on how to select dies for specific jobs, tonnages required, etc. Representing the culmination of twenty-five years of Verson Die Manuals, this edition has been developed and organized to be as convenient and helpful to the user as we know how to make it, even to the point of incorporating a plastic binding that permits the book to lay flat wherever it is opened. While the Manual does not show every possible press brake die, it is remarkably complete and covers all commonly used types. To get your copy simply write on your company letterhead.

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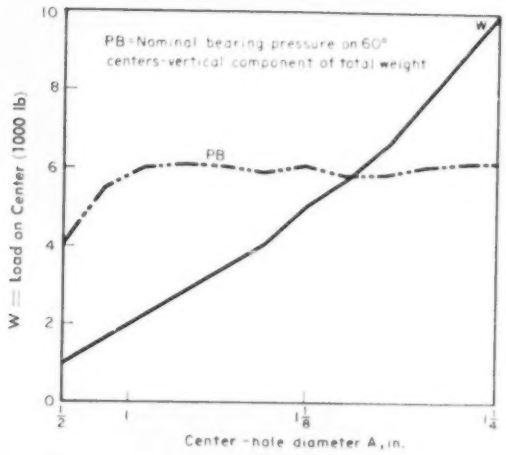
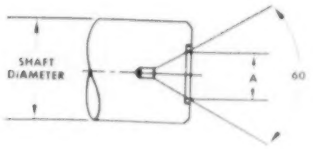
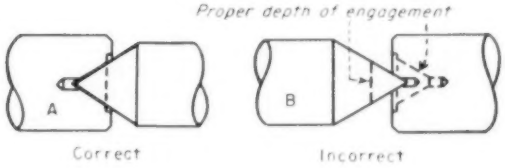
American Machinist REFERENCE BOOK SHEET

Selection of Center Holes

BY CARL B CHRISTENSEN, President, READY TOOL CO


PB=Nominal bearing pressure on 60° centers=vertical component of total weight
W
PB
W = Load on Center (1000 lb)
Center-hole diameter A, in.





GUIDE FOR CENTER-HOLE SIZE

Max. Load on Center, Lb	Center Hole Dia A	Center Drill Size	Shaft Dia. Min
100	1/8	-C-2	1/4
250	5/32	-D-1	5/16
500	3/16	-E-1	3/8
750	1/4	-E-2	1/2
1,000	1/2	-M-1	1
2,000	1	None	2
5,000	1 1/8	"	2 1/4
10,000	1 1/4	"	2 1/2
20,000	1 5/8	"	3 1/4
30,000	2	"	4
40,000	2 1/4	"	4 1/2
50,000	2 5/8	"	5 1/4
60,000	3	"	6
70,000	3 1/4	"	6 1/2
80,000	3 1/2	"	7
90,000	3 3/4	"	7 1/2
100,000	4 1/4	"	8 1/2
125,000	5	"	10
150,000	6	"	12
175,000	6 3/4	"	13 1/2
200,000	7 1/2	"	15
300,000	8	"	16

When work machined between centers is found to be faulty, the causes are likely to be: (1) the center-hole size is not correctly proportioned to the workpiece weight, (2) the center hole was not drilled to the correct depth or angle, and (3) the center itself is either worn or was not ground to the proper included angle.

From eight years of experience in using the accompanying chart and table, we find that center-hole troubles can be avoided. These data are based on limiting the compressive stress to 25,000 lb per sq in. of projected bearing surface. For example: if the total weight of the workpiece is 20,000 lb, you will have to use a 1¼-in. center hole.

The chart and table are based, furthermore, upon proper engagement of the center with the center hole. In the "correct" design illustrated, the center-hole diameter at the bottom of the countersunk recess is correct, and equal to *A* in the table. In the "incorrect" design, however, the center hole has not been drilled to proper depth, the center does not engage the hole properly, and the compressive stress on the projected bearing surface exceeds the safe value of 25,000 psi.

The center hole should have an included angle of 60°, and for truly accurate work it should be lapped. The center itself should be ground to 60° 15′ ± nothing, to insure that center hole makes proper contact with the surface of the center.

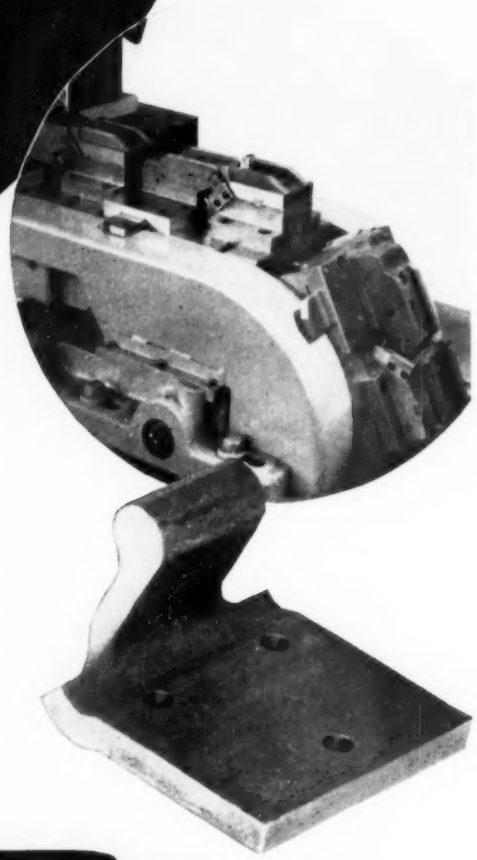
For weights under 2000 lb, the table lists the standard sizes of center drills to use. For weights of 2000 lb and up, there are no standard center-drill sizes. However, there are listed the sizes of center holes that will carry weights up to 300,000 lb safely and accurately. Another feature of the table is the listing of minimum work-shaft diameters.

These data have been tried and accepted in all types of manufacturing by chief engineers, designers, tool engineers, and shop men.

lower cost per piece . . .

with continuous surface broaching of small parts

• Holding fixtures are designed for quick, convenient loading, with automatic clamping and unclamping.



• In many plants where large quantities of duplicate metal parts are being machined substantial savings are being made through the adoption of surface broaching. Production is exceptionally high, close tolerances are maintained, and tool maintenance costs are much lower than with ordinary methods. Foote-Burt engineers, pioneers in this advanced machining method, have had a wide experience in applying surface broaching in many fields.

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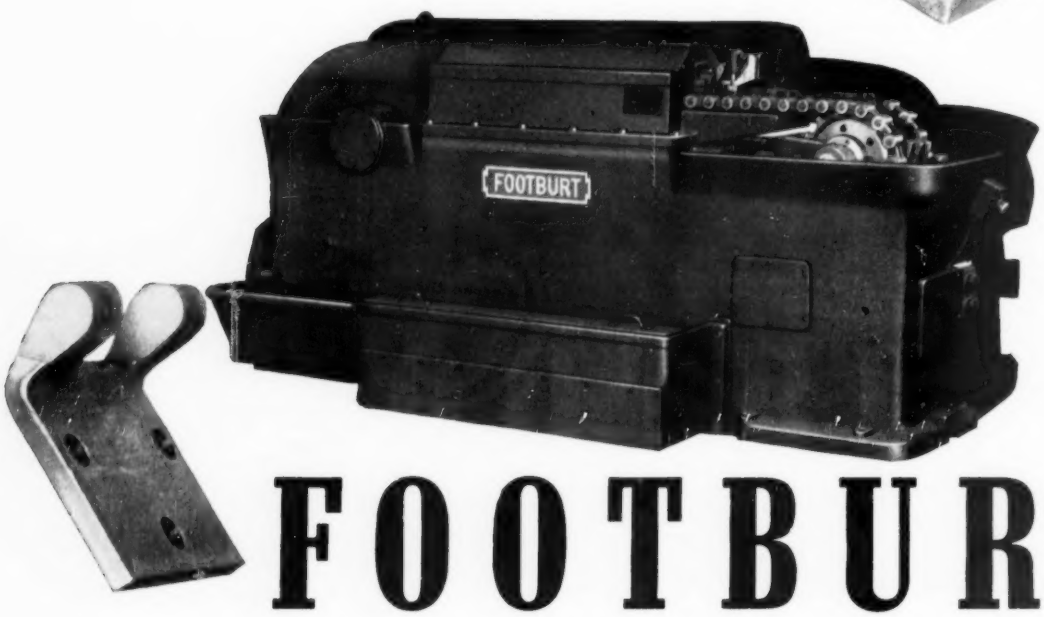

FOOTBURT

PRODUCTION MACHINE TOOLS

American Machinist REFERENCE BOOK SHEET

Blanks for Thread Rolling...I

BY CLIFFORD T. APPLETON, Vice President, REED ROLLED THREAD DIE CO.

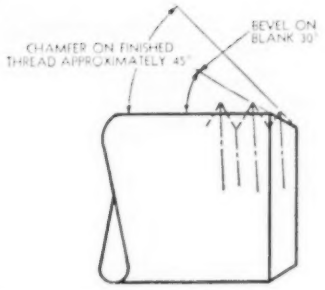

FIG. 1 . . . First thread with 30° bevel

Blanks used for thread rolling are smaller in diameter than the major diameter of the finished thread, because the material displaced to form the roots is forced outward to form the crests. With an American Standard thread form, the blank diameter approximates the pitch diameter of the finished thread.

Ends of the blanks should be bevelled to prevent excessive chipping of the threads on the dies or rolls. For general conditions, a bevel 30° from the blank axis is preferred. The diameter at the small end of the bevel should be less than the minor diameter of the thread.

In rolling, the end threads bend outwardly, Fig. 1. That is why bevels in excess of 30° are not desirable. For harder blanks, angles of 25, 20 and sometimes 15° are used, Fig. 2. The length of the bevel is

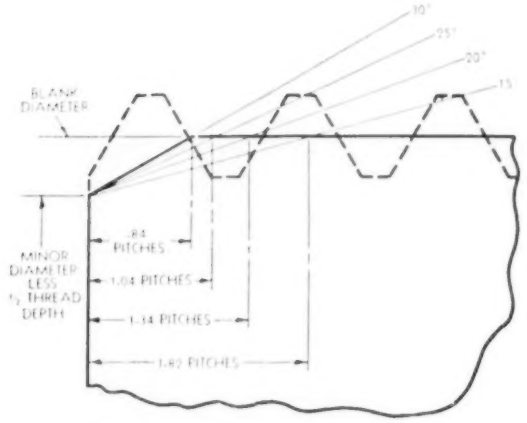

FIG. 2 . . . Bevel lengths on blank diameters of American Standard threads

table I . . . Minimum Blank Diameter

Material	Hardness	% of Pitch Diameter Tolerance (Used to determine the amount to be added to Minimum Pitch Diameter)
Aluminum Alloy	Soft	30–50
	Hard	20–40
Brass and Bronze		20–40
Steel:		
10–15 Carbon	Soft	0–20
30–50 Carbon	Soft	20–40
30–50 Carbon or Alloy	15–25 Rock. C	30–50
30–50 Carbon or Alloy	26–32 Rock. C	40–60
30–50 Carbon or Alloy	33–40 Rock. C	50–70
Stainless, Chrome-Nickel Alloy (300 Series)		60–80
Stainless, Chrome Alloy (400 Series)		40–60

table II . . . Approximate Blank-Diameter Tolerances

Work Tolerances (in inches)		Thread Diameters — in Inches					
Major Diam.	Pitch Diam.	Up to ½	½–1	1–1½	1½–2	2–2½	2½–5
.002	.001	.0003	.00025	.0002			
.003	.0015	.0005	.0004	.0003			
.004	.002	.0007	.0007	.0006	.0005		
.006	.003	.0010	.0010	.0010	.0008	.0006	
.008	.004	.0013	.0013	.0013	.0010	.0010	
.010	.005	.0015	.0017	.0017	.0015	.0015	.0010
.012	.006	.002	.0020	.0020	.0020	.0015	.0015
.014	.007	.0023	.0023	.0023	.0023	.0023	.0020
.016	.008	.0025	.0025	.0025	.0025	.0025	.0025
.018	.009	.0025	.0025	.0030	.0030	.0030	.0030
.020	.010	.0025	.0030	.0030	.0035	.0035	.0035
.022	.011	.0025	.0030	.0035	.0035	.0040	.0040
.025	.012	.0025	.0030	.0035	.0040	.0040	.0040
.030	.014	.0025	.0030	.0035	.0040	.0040	.0040
.035	.016	.0025	.0030	.0035	.0040	.0040	.0040

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IN
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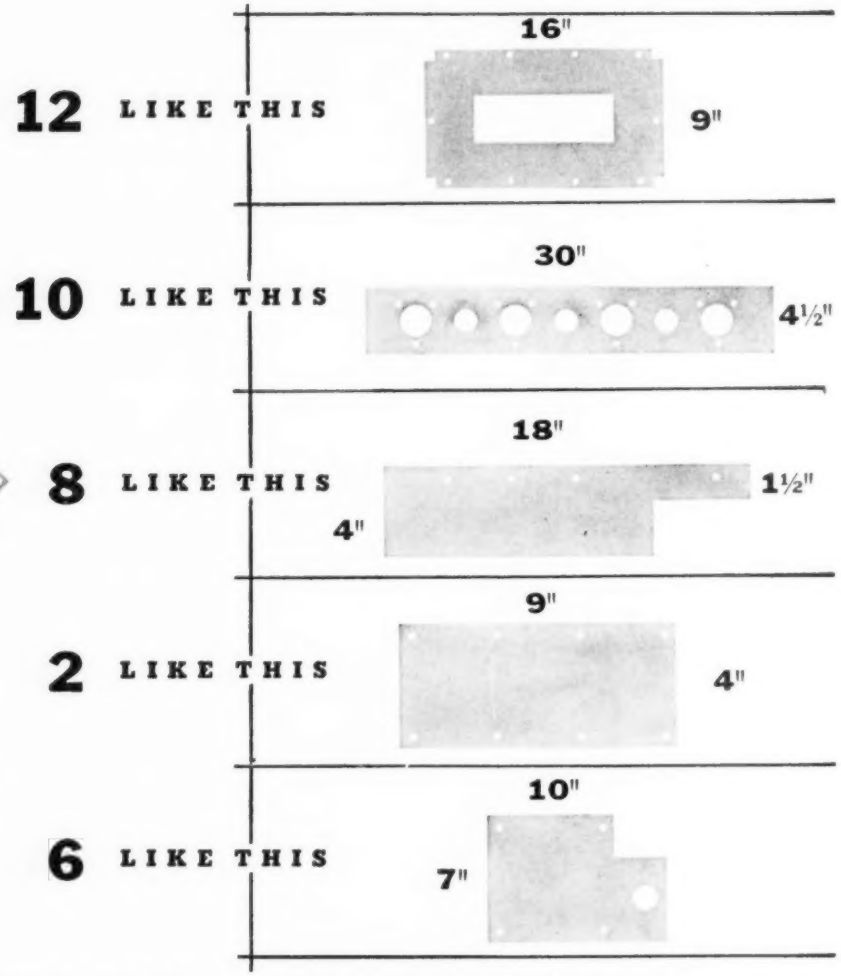

The company producing the above parts has eliminated inventory of these and many other items; has greatly reduced inventory of punches and dies—and they no longer need to stock templates.

The Wiedemann method enables them to ship parts directly to assembly rather than the stockroom.

Items are produced weekly or more often if necessary. Sizes of parts pierced on the Wiedemann range from 5 ft. by 10 ft. down to 2" squares.

Inventory and storage reduction are just two of many cost-reducing features of Wiedemann Turret Punch Presses. We'll gladly make a time study on your own work.

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4272 Wissahickon Avenue, Philadelphia 32, Pa.

Blanks for Thread Rolling...II

measured on the blank diameter.

Blank-diameter limits are affected by the kind and hardness of material and the surface finish. On shorter thread lengths, especially with very soft materials, there is some endwise stretching of the blank. To offset this effect, and obtain sufficient radial displacement of the material, increase the blank diameter.

Table I will be helpful for determining blank diameters for infeed rolling of American National threads of one diameter long up to 1 in. in dia and not less than 1-in. thread length for diameters over 1 in. Suggested minimum blank diameters for various materials may be obtained from this table by adding a given percentage of the pitch-diameter tolerance to the minimum pitch diameter of the work.

The approximate blank-diameter tolerance is obtained from Table II, according to the nearest major and pitch diameter tolerances for the thread diameters shown. The major diameter tolerances are twice the pitch diameter tolerances listed in the next column. Where the major diameter tolerance is less than twice the pitch diameter tolerance, always use the blank-diameter tolerance opposite to the major diameter tolerance.

The major blank diameter may be found by adding the blank-diameter tolerance to the minimum blank diameter.

On shorter thread lengths, the blank diameters are usually increased by larger percentages than those given to compensate for endwise stretching of the blank.

Abstracted from "Engineering Data on Thread and Form Rolling", *a copyrighted publication of the Reed Rolled Thread Die Co.*

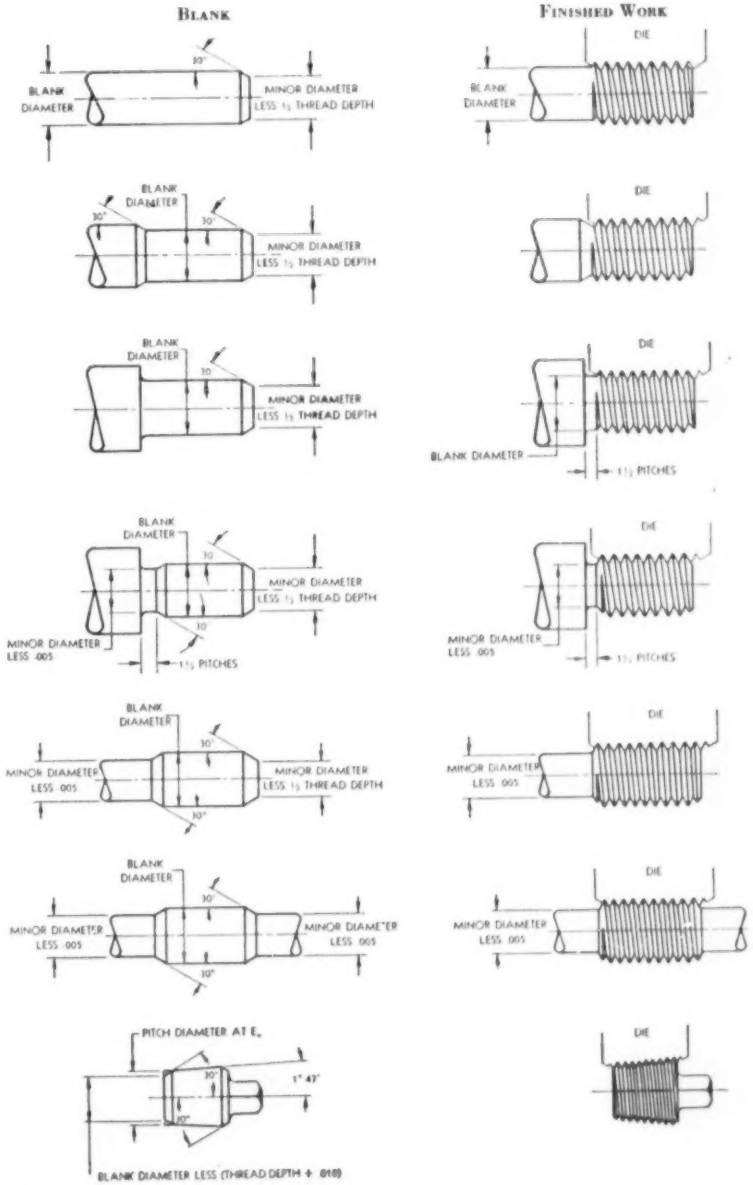


FIG. 3 . . . Preparation of blanks for thread rolling

How Armco ALUMINIZED Steel Solved a Contraction Problem

Before this stack connected with a high-temperature fractionating column was sheltered by a rain-shield made of Armco ALUMINIZED* Steel, driving Gulf Coast rains were a serious hazard. The stack operated normally at 700 degrees F, but semi-tropical rains would cool the windward side down to 300 to 400 degrees F, while the lee side of the stack remained at operating temperature. Uneven contraction would cause the stack to bow.

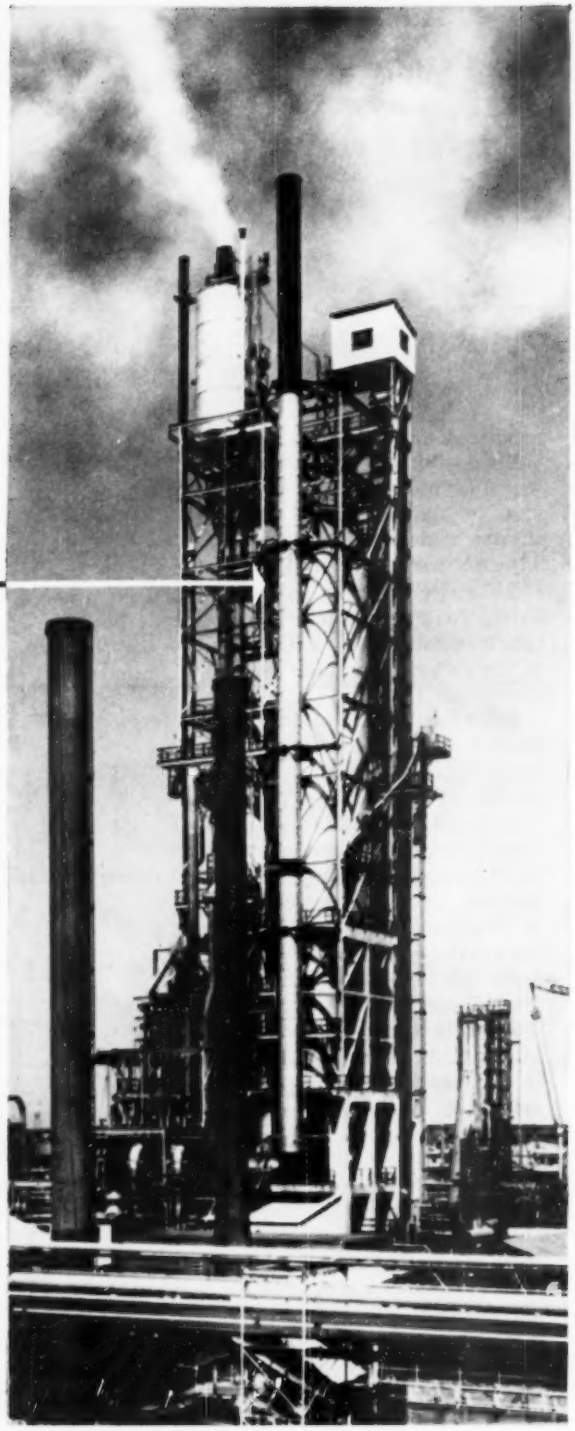
SOLVED CRACKING PROBLEM

Structural supports were rigid and would not permit much movement of the stack. Yet something had to give, so cracking of the stack was an ever-present threat. To protect the stack from failure, it was fitted with a shield of Armco ALUMINIZED Steel with an airspace between shield and stack. This protected the stack from wind and rain, prevented uneven contraction and solved a serious problem for the oil refinery.

HEAT- AND CORROSION-RESISTANT

Its combination of heat- and corrosion-resistance makes Armco ALUMINIZED Steel ideal for many applications like this. At temperatures up to 900 degrees F it is used for heat reflection; at higher temperatures it becomes an excellent radiator of heat.

For more information on this special aluminum-coated steel, phone the nearest Armco District Office or write us at the address below.



An Armco ALUMINIZED Steel raincoat for a stack

See our catalog in "Sweet's Product Design File" for information on the other Armco Special-Purpose Steels.

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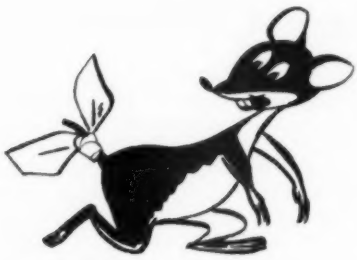
TALKING SHOP



Rat Tale

A CHANGE in generator insulation from cotton wrap to a plastic dip solved a problem caused by the shortage of the right kind of cotton and gave a better result. At the same time, a production problem was created. As the coils, hung from a conveyor as they were dipped, angled up out of the tank, the plastic ran down and formed a rat tail. By the time the plastic had hardened, this tail might be 6 or 8 in. long. Production was high and six girls were required to snip off the tails. Engineers went to work to eliminate this costly operation. They experimented with changes in density and composition of the dip, but when it didn't form a rat tail it wouldn't insulate adequately, and when they obtained needed insulation there was the rat tail again. Then the janitor offered a suggestion. "Why don't you," he said, "change the angle of the conveyor so the coils ride just above the surface of the tank while they drain." It worked. The six girls moved on to more productive work and the janitor collected a $2500 award.

Stitches Save Time

METAL STITCHING is finding increasing application as an assembly method. An example is the change in the revolving drum brushes built by Parker Sweeper Co. Formerly, five wooden-backed brushes were attached to the drum. Each brush had 27 drilled holes in which tufts of bristles were secured with wire. Now fiber bristles are placed between two half-hexagon strips of 18-gage steel and held with hand clamps at each end until the steel strips have been stitched together with an Acme steel stitcher. Two of these sections replace the former drum. With the same number of workers, output increased 4½ times and there are 50% more bristles to lengthen life.

Break With the Past

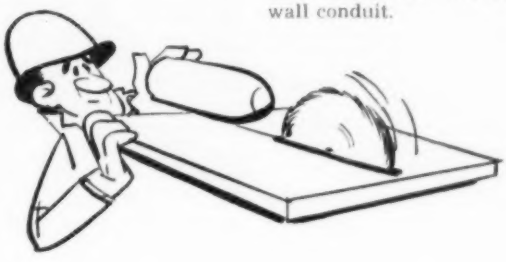
WHEN the British Productivity Teams came over in recent years to study US production methods, the Forging team wrote a highly critical report of British practice. One major defect is the insular habit of one furnace to one hammer, with the hammer crew playing pinochle while "waiting for the heat." One new plant in England has made a complete break with the past in its methods. But to make the new methods work, one requirement proved necessary: Every employee must be a man with no previous experience in a forge shop.

Miniature

RECENT FACT on miniature ball bearings: Daily output of a plant like New Hampshire Ball Bearings at Peterborough, N H, or Miniature Precision Bearings, Inc, at Keene, N H may be only 10 lb, but is worth $1000 to $2000 a pound. You can put about 300 finished bearings of the smallest size in an ordinary teaspoon.

Beefed-Up Steel

AT LOCKHEED, a new heat-treating cycle is making it possible to use 4340 steel that has a tensile range of 260,000 to 280,000 psi, instead of the usual 180,000 to 200,000 psi. Landing gear and other highly stressed parts can be made lighter as a result. New cycle includes normalizing at 1600 F, then austenitizing at 1500 F. For the latter, parts from ¼- to 1-in. dia are heated for 45 min, held at temperature for about an hour; parts 1- to 2-in. dia are heated 1¼ hr and held 2 hr. After oil quenching, parts are drawn for 4 hr per in. of cross-section at 400 to 500 F, with a minimum of 4 hr. Finally they are heated to 250 F for 24 hr to stabilize any residual austenite. This gives optimum tensile-yield ration and maximum ductility and toughness for the strength.



Customer Parking

BUHR MACHINE TOOL Company's plant is almost in the shadow of the stadium of the University of Michigan where it is not unusual to draw stadium capacity (97,000 people) to a football game even when the team is of only average calibre. People drive down to Ann Arbor from Detroit and other major cities, and traffic and parking conditions near the stadium are frantic on week-ends. Buhr has come up with a smart solution. It rents a club house across the street from the plant and hands out about 75 tickets to home games to customers in Detroit, Flint, Saginaw, etc, along with parking passes for its private parking lot. Result: Buhr's guests drive in to Ann Arbor a couple of hours ahead of the main crowd, park their cars 400 yards from the stadium, go to the club house where a bar and buffet keep them entertained until game time. While they're at the game, their cars are under the watchful eye of one of the company's guards. When the game's over, instead of battling traffic for the next several hours, guests return to the club house (where Buhr's wisely serves only beer after the game), spend a couple of hours talking. When traffic is cleared, all the guests can drive home relatively easily.

Remote Saw Control

WE'VE BEEN HEARING stories about the manless atomic shops. However, this is not the only instance in which there are special hazards. A Naval Ordnance Test Station has installed a band saw to cut shells and other explosives apart for interior inspection. The ever-present danger of explosion makes remote control necessary. A DoAll Model MP-20 saw has been adapted for control of every phase of operation from a remote panel in a safe location. Controls require both hydraulic and electric lines which are housed in heavy-wall conduit.

News of Metalworking

Defense Dept. Tightens Regulations To Cut Down Over-Financing of Procurement by the Military

WASHINGTON—The Defense Department is now putting the finishing touches to its new policy on contract financing. Basically, it boils down to this: defense contractors are going to have to rely more on outside financing to get started on contracts. It's all part of Defense Secretary Wilson's plan to cut down over-financing of procurement by the military.

The new policy pertains mainly to supply contracts and only slightly to those for construction, services and research.

Last January, when Wilson and his team took over the reins of the Pentagon, they discovered that military procurement officers hadn't been paying too much attention to a section of the Armed Services Procurement Act, which limits the amount of funds the government is supposed to advance to a contractor to get work started. Result was that hard goods manufacturers had gotten billions in advance funds to buy inventories of equipment in order to get rolling.

What had happened on long lead-time contract was that the government found itself owning material in contractors' warehouses that became obsolete or unnecessary due to engineering and design changes before production really got rolling. So, costs of contracts began to climb.

Urges Private Financing

Wilson figured that if the contractors have to use their own funds or borrow from private lending institutions, there would be less inclination on their part to overstock material. That's why he ordered tightening of procurement policies. Wilson's Dept of Defense Directive 7800.1 says that government financing should be provided only if required for prompt and efficient performance of government contracts. The kicker is that the contractor must use his own funds and outside borrowing to the fullest extent possible before getting government aid.

Here's the order of preference procurement orders now must follow when financing a contract: (1) private financing without government guarantee, (2) guaranteed loans with financing institutions participating to an extent appropriate to the risk involved, (3) progress payments, and (4) advance payments.

To make sure this policy is followed, the Defense Dept has set up a Contract Finance Committee headed by Asst Secretary of Defense Wilfred J McNeil. Each service has two representatives on the committee, plus one man representing the Office of the Assistant Defense Secretary for Supply.

Replacing Steel Jig Bases With Concrete

SEATTLE — Substitution of reinforced concrete for steel in non-adjustable jig parts has effected a 25% cost saving and improved stability of Boeing Airplane Co here. And it provides the answer to bigger jigs for bigger planes.

The jig itself is still constructed of steel, but the base is made of concrete. Previously jig foundations were made from stress-relieved large steel beams, machined and set up at a precise level—an expensive process.

Used for B-52 Assembly

Boeing's first steel-concrete jig is being used in assembling horizontal stabilizers for B-52's. The base consists of a central 10-ton "tower," with 12 smaller piers stepped up in size at the same angle as the trailing edge of the stabilizer.

The concrete base has proved to be even more stable than the plant's concrete floor. Its mass has a dampening effect on machine vibration, preventing jarring of the precision-set jig parts it supports.

CONCRETE BASE FOR JIG is cast outside Boeing's Seattle plant. Concrete's low expansion factor minimizes alignment variations often found in steel bases

"We Expected It" Says Army Ordnance As M-47 Tank Gears Fail in the Field

WASHINGTON—Word that M-47 Patton tanks were breaking down on Army maneuvers in Europe because of a faulty final-drive gear mechanism caused a brief sensation in the nation's press recently. But officers at the Detroit Automotive Tank Ordnance Center made it plain they fully expected the gears to fail after some 500 miles of service.

This statement, if anything, has added fuel to the fire, particularly since American Locomotive Co, producer of M-47's along with Chrysler, shortly afterwards announced the shutdown of its M-47 operations. Subcontractors affected by the Alco shutdown are the J W Greer Co, Wilmington, Mass.; Brad Foote Gear Works, Cicero, Ill.; Oliver Corp, Cleveland; and Alco's Syracuse plant.

Army Ordnance explains the gear failures this way: the M-47 was one of the weapons produced shortly after the outbreak of Korea. Thus its proving period was cut short due to the need for it in combat. Actually, the tank never did get into combat in Korea. And rather than put it through extensive test periods at Aberdeen Proving Grounds, Ordnance decided to test the M-47 in the field, with any bugs discovered being changed in the production line later.

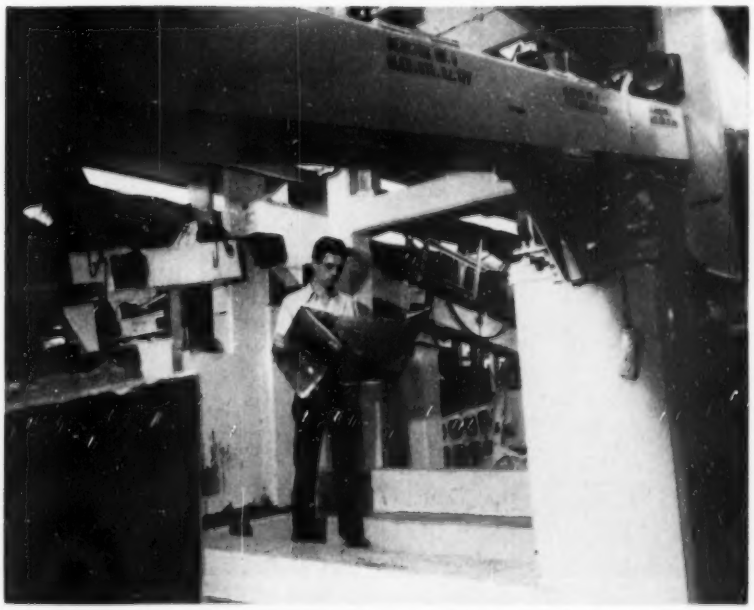
Reason behind the failures is that suitable metals, particularly nickel, were in short supply and manufacturers had to use lower grade steels than those called for in the original specifications. Both the contractors and the Army knew that the final-drive mechanism would have a short life. But even so, nobody expected them to go out in wholesale lots. And Ordnance didn't expect the breakdowns until the tanks had run at least 500 miles.

The original problems of the gear's metallurgy-physical strength have now largely been overcome—chiefly the search for gears with more precise tolerances—and therein lies the reason for the Alco shutdown. The demand for closer tolerances has created inevitable limited-output production problems at Alco, where the shutdown has been caused by an insufficient number of high-quality gears—not the fact that gears made years ago are wearing out in the field.

Detroit Ordnance officers have emphasized that no such shutdown would be permitted if a war were underway, since specifications would merely be lowered to keep production going, even though the final drives wouldn't deliver as much service. Neither Alco nor Chrysler Corp, which made the Patton until Nov 11 of this year, had any of its production models rejected for faulty drives.

Cuts Costs 25% at Boeing Seattle

MOVING THE CONCRETE JIG BASE into place using truck and crane



CONCRETE BASE IN POSITION, where it supports the entire steel jig. During final assembly, slanted beam will hold a B-52 stabilizer in place

OPTIONAL DEPRECIATION: KEY TO MACHINE-TOOL OUTLOOK

NEW YORK — The tax situation is the key factor in the outlook for the machine-tool industry, Tell Berna, general manager of the National Machine Tool Builders' Association, stressed in addressing the New York Society of Security Analysts Nov 25.

Sales prospects of the industry during the next few years hinge on this factor, Mr Berna said: will Congress approve optional depreciation?

Largest Market: Replacement

Mr Berna said the industry's largest market today is replacement generated by widespread obsolescence of equipment, as shown by the new *American Machinist* Inventory. Secondarily, there will be a demand for machine tools for expansion purposes and for tooling up new product.

Defense and Foreign Orders

Defense orders recently have varied from 10 to 17% of total demand and should continue for some years at about that rate, Mr Berna predicted. The foreign market represents only 7% of the industry's total volume and won't change for the better until dollar shortages are eased and nationalistic buying programs are either modified or abandoned, Mr Berna concluded.

Pentagon Schedules Military Goods Production—But Details Are Secret

WASHINGTON—The Defense Dept has finally come up with production schedules for about 1000 principal military products that would be needed to fight the first three years of an all-out war. In mobilization planning reports submitted to ODM, the Pentagon has outlined the quantities of each end-item needed, estimated costs, and known industrial suppliers and their productive capacities.

Shows Up Defense Gaps

This is the study that has been underway for months—designed to show up gaps in the nation's mobilization base.

Schedules given ODM include vehicles, aircraft, ships, guided missiles, ammunition, weapons, electronic equipment, construction and transportation equipment, and materials handling items. These represent about 85% of all military hard goods procurement.

The new end-items requirements reflect the most-up-to-date strategic war plans of the Eisenhower-appointed Joint Chiefs of Staff. It's understood that there's little departure in these from strategic war plans drafted by the old JCS. The preliminary schedules were submitted late last month. The end-item requirements are now being translated into raw material needs.

"Most Significant Data"

These are the most significant data on military requirements ever compiled for a civilian agency or government, ODM says. The compilation is in line with ODM's mobilization base maintenance program and has been sought from Pentagon for over a year.

ODM has already received similar requirements from government claimant agencies for defense-supporting and essential civilian industries. ODM's task now will be to determine the industrial feasibility of the total potential requirements for a three-year war, i.e, are there adequate raw material, fabricating and assembly plant facilities to produce the required goods?

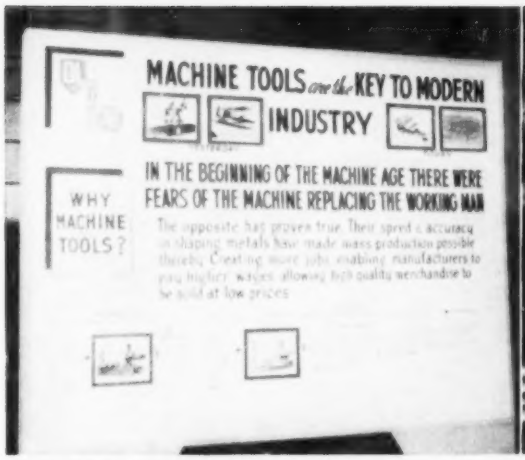
From this study will come either: (1) modifications of mobilization requirements to fit into available capacity, or (2) new government-supported expansion programs to cover deficiencies.

Final action on the Defense Dept's $250-million Vance Plan for long lead-time machine tools will be based on the latter decision.

Lyon Metal Products Plant Celebrates

BEFORE remodeling, this manufacturing aisle at Lyon Metal Products, Inc's Aurora, Ill, plant was blocked by a brick partition and wood posts

AFTER remodeling, posts and partitions are gone, allowing for better production flow. Manufacturing has been centralized. New paint job makes for brighter work area


MACHINE TOOLS are the KEY TO MODERN INDUSTRY
WHY MACHINE TOOLS?
IN THE BEGINNING OF THE MACHINE AGE THERE WERE FEARS OF THE MACHINE REPLACING THE WORKING MAN

ROLE OF MACHINE TOOLS IN TODAY'S INDUSTRY is explained in this placard, one of many displayed at the recent Giddings & Lewis open house at Fond du Lac, Wis

INNER WORKING OF MACHINE TOOLS were explained in detail to the 1100 guests attending the four-day open house

Open House Highlights Role of Machine Tools in Modern Industry

FOND DU LAC, WIS—More than 1100 prominent metalworking executives from all over the country were given a "behind the scenes" look at machine tools in the making during Giddings & Lewis Machine Tool Co's recent four-day open house.

Highlighting the open house was a 2½-hour tour of Giddings & Lewis Plants 1, 2 and 3, and G & L's Davis Boring Tool Division. Company field engineers acted as guides, explaining the operation and functions of such machine tools as a huge double housing planer, giant skin mill machines, a three-dimensional tracer control unit with touch so sensitive that a visitor could operate the machine and actually write his name with it on a sheet of paper.

During the open house, the world's largest die-sinking tracer machine, composed of two horizontal boring machines riding on a common runway 61 ft long was assembled. At Davis Boring Tool Division, visitors witnessed manufacture of stub boring sets and blocks.

LANDIS' 50-YEAR HISTORY TOLD IN BROCHURE

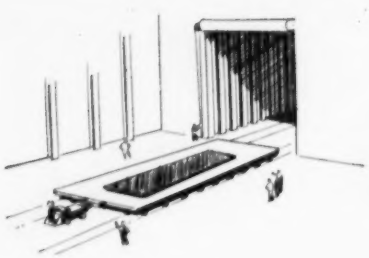
WAYNESBORO, PA—Fifty years of thread generating progress is told in "Landis Men and Machines," an illustrated brochure marking the 50th Anniversary of the Landis Machine Co, manufacturers of threading machinery.

Included in the booklet is a history of the company, a tribute to its men, details on its expansions over the years, a showing of past and present lines of Landis products, plant photographs from 1909 through 1953, and graphs showing expansion progress and sales increases year by year.

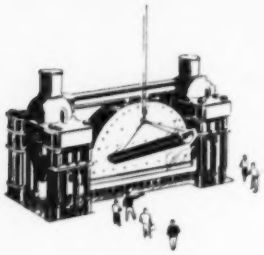
Facelifting With Open House

BEFORE remodeling, this location was used for welding boxes. Centralized die storage area cut into work space. Too many columns. Ceilings are only partially painted

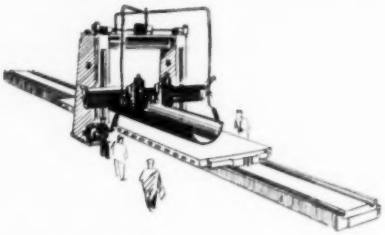
AFTER remodeling, steel replaces wood columns, allowing general machine department to be located in direct production flow line. Dies are out of way, closer to machines



① Preheating



② Bending



③ Planing

New $5-Million Pressure-Vessel Plant Expected to Cut Fabrication

MOUNTAINTOP, PA — A reduction of 40% in fabricating time and a speedup of several weeks in delivery time for heavy pressure vessels will be achieved when Foster-Wheeler Corp's new $5 million plant goes into operation here on or about January 1.

To Employ 500 Workers

Some 500 workers will be employed in full production of large boilers, drums, stills and industrial process equipment. Chief reason for the plant's unique location atop a mountain in the Wilkes-Barre anthracite mining region is the local surplus of skilled workers, who will require little or no training.

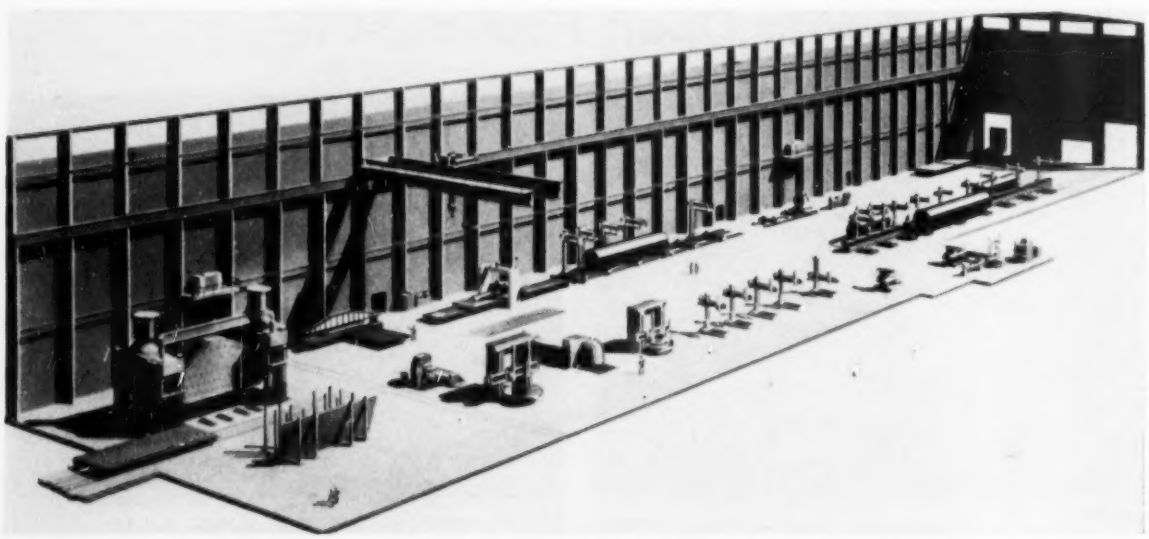
The new plant consists of a high-bay main building, a 76½-ton stress-relieving furnace and an X-ray building housing a 2-million-volt betatron, capable of penetrating 12 in. of steel in seconds, instead of the 35 hr required by gamma rays.

Plant's main building consists of a 90x800x75-ft high main bay with 50-ft clearance under crane hooks; South side bay is 35x500x40-ft high with 27-ft, 8-in. under crane hooks; North side bay is 35x450x12-ft high and houses offices, lockers, washroom, cafeteria, storage room.

Four cranes are in operation: one 150-ton with 90-ft span; one 50-ton with 90-ft span; one 40-ton double trolley with 90-ft span; and one 25-ton with 30-ft span.

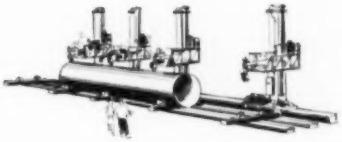
Processing on a typical large (125-ton) pressure vessel begins with rail delivery of 28-ft, 3-in.x9-ft, 6-in.x4¾-in. steel plates. These are preheated to as high as 2100 F in a large normalizing furnace that can accommodate several plates at once.

Flat car carries plates to an 8000-ton hydraulic beam press, where they are lifted by crane onto the dies. Beam press, which is actually a combination of two 4000-ton, four-col-



INTERIOR of Foster-Wheeler's new $5 million plant at Mountaintop, Penna

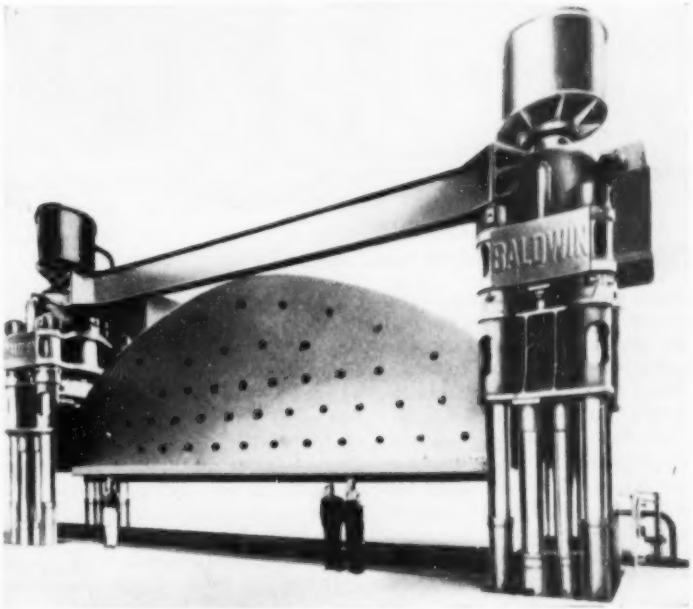
④ Assembly



⑤ Welding

⑥ Drilling

Time by 40%



8000-TON HYDRAULIC BEAM PRESS, one of the world's largest, can bend 8-in. steel plate used in fabricating heavy pressure vessels

umn presses coupled by laminated steel beams, can bend hot or cold 8-in. steel plate—or lighter plate 40-ft long—into half shells. Three sizes of dies are used.

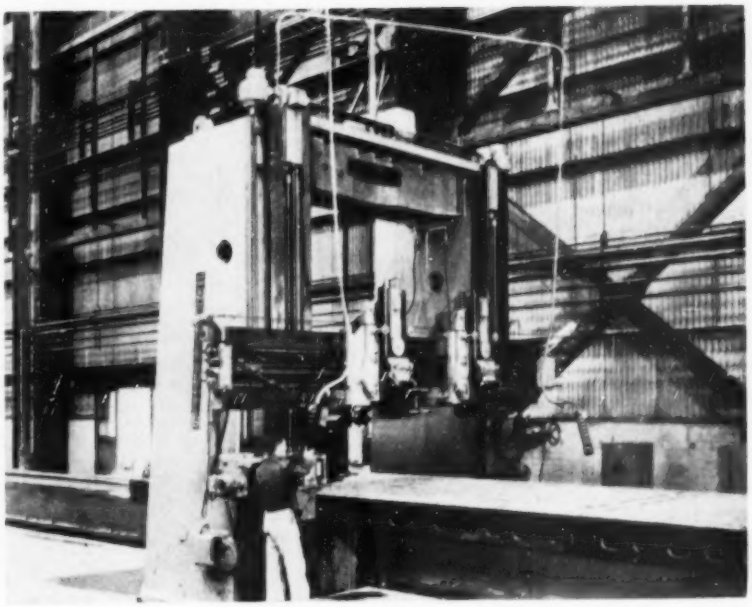
Plate Positioner

Built-in plate-handling device positions plates weighing up to 40 tons with minimum temperature loss and high degree of accuracy. Unit consists of four 7-in.-dia lift cylinders and eight 3¼-in.-dia manipulating cylinders, rollers, pushrods and pins. The press then exerts 8000-lb pressure on the plate to form a half cylinder.

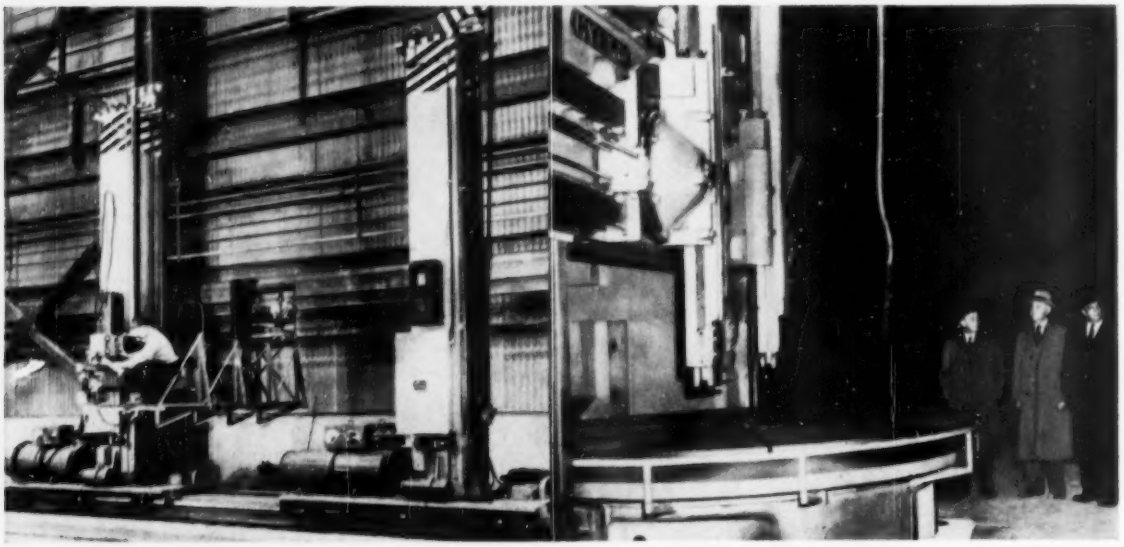
When the four plates have been formed, they are moved on a 50-ton car, two at a time, for shot-blasting. Next, the cylinders are moved onto a bed planer with table travel area of 44 ft and over-all bed length of 92 ft.

The four shell sections are then assembled to form two cylinders, each 72-in. ID and 28-ft, 3-in. long.

Cylinders next move to the automatic shielded arc-welding setup. This setup is unusual in that two



BED PLANER has table travel area of 44 ft; over-all bed length of 92 ft. Width between the planer's double housings is 122½ in.



Pressure-Vessel Plant (continued)

electrodes are applied simultaneously to the weld, increasing penetration rate and deposition. U-grooves are machined on a plate planer to leave ¼-in. land, regardless of thickness, then submerged-arc welders and automatic flux recovery welders traveling on a 150-ft track deposit weld metal in the seams. Backing strip is removed and inside seams are chipped and welded.

Cylinders next move to the drum-end facing machine, where grooves are machined into cylinder's circular ends. Dished heads are then ready for assembly to the cylinders. Two cylinders are joined, test plates are removed, heads are joined, and vessel is returned for circular seam welding.

X-Ray Inspection

Following hand installation of nozzles and connections, drum is carried on flatcar to the X-ray building, where it is photographed and the film quickly developed and inspected. If flaws are apparent, weld metal is chipped out, the drum is rewelded and X-rayed again.

Heat Treating

Drum then moves into the heat-treating furnace, where 80 propane gas burners heat it to about 1200 F for five hours. Drum cools slowly, then is returned to the main building for hydrostatic test at 2323 psi.

Next, drum moves to the radial drilling setup, located on a 230-ft platform. Setup has two sets of high-speed radial drills based 4 ft from floor, each with an 8-ft arm and 18-in. column mounted and arranged in series—one set of six with the two end drills fixed, and another of four with one end drill fixed. Drills can be positioned anywhere along the ways, and workpiece can be positioned either side of ways. Some 300 holes are drilled and grooved. A 150-ton crane, or if drum is extremely large, a 150-ton crane and a 50-ton crane, lift the vessel and place it in a gondola car for shipment.

TWIN-ARC WELDING MACHINES (left) can weld 8-in. plate at speeds much faster than single-wire welding units. Welders are mounted on platforms that travel along 150-ft track, can be raised or lowered to accommodate workpieces up to 12-ft dia

BORING MILL (right) has 151-in. maximum swing and height under rail of 86 in. Inspecting mill are officials of Jersey Central RR and at right, F-W President E W Mills

HEAT-TREATING FURNACE is equipped with 80 Foster-Wheeler-designed propane gas burners. Interior dimensions: 83½x15x14½-ft high

Metal Trades Association Meeting Discusses Business Outlook, Industrial and Human Relations

CLEVELAND — "The Individual's Responsibility in Modern Industry" was the theme of the two-day 1953 Convention of the National Metal Trades Association here Nov 18-19.

Major topics of the two-day meeting included the 1954 business outlook, Taft-Hartley, human relations, and industrial relations.

Newly elected president of NMTA Earle S Day, vice president and general manager, Collyer Insulated Wire Co, Pawtucket, R I, in his inaugural message predicted that 1954 will see no major recession.

"I do not doubt," he said, "that 1954 will see many adjustments for many industries and perhaps a mild adjustment for industry as a whole, but . . . there is already too much loose talk about slumps, bumps and dips, which in some cases is due to ignorance and misinformation and in others stems from an inability to face the facts of healthy competition.

"There is far greater danger of a recession caused by self-hypnosis than from economic cause," Mr Day concluded.

Other new NMTA officers are: second vice president and treasurer, Walter F Newhouse of Saranac Machine Co, Benton Harbor, Mich; and vice president, Norman L Rowe of Ideal Roller & Mfg Co, Long Island City, N Y.

Washington Attorney John C Gall, counsel for Southern coal operators, speaking at a session on "What We Should Do About the Taft-Hartley Law," urged that the law be strengthened so as to serve the purpose for which its creators and Congress intended it. Current amendments offered by labor would destroy the law, he said.

NEW NMTA PRESIDENT
Earle S Day
VP and General Manager
Collyer Insulated Wire Co

Also on the subject of labor relations, speaker John G Mapes, president, Group Attitudes Corp, said that "industrial employees are less interested in getting a general pay increase than in having wage inequities corrected."

Prof Thomas G Spates of Yale University, speaking on "Why Bother About People," said that the best way to fill critical gaps in knowledge, skills and attitudes is to employ individual periodic two-way performance appraisals. American business, he said, must meet this challenge—to see "that people at all levels of organization shall get spiritual as well as material satisfaction from their daily work experience."

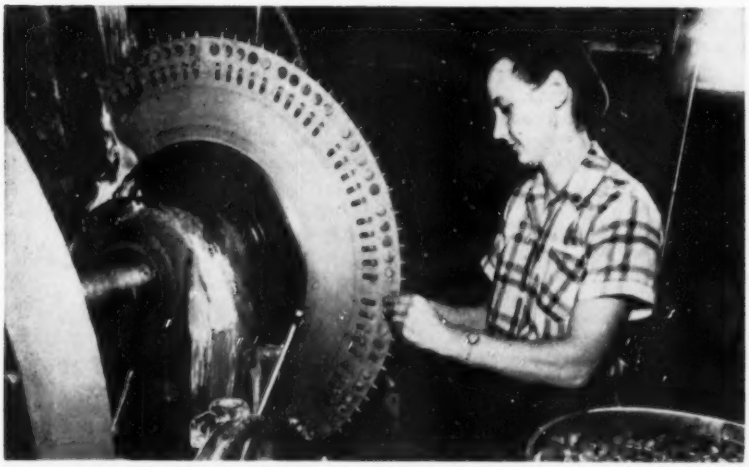
Discussing "How Management Can Take the Lead in Industrial Relations," a panel headed by Milton O Cross, Jr, president, The Cross Co, said that there are three vital factors in communications between employers and employees: (1) get the facts straight and deliver the message in friendly but forthright terms, (2) develop the habit of positive expression, and (3) use plain, everyday words. "The heart of an employee communication program," he concluded, "is not broadcasting but receiving."

F K Becker, president, Bird Machine Co, speaking in the same panel discussion, said "the shop foreman is the human embodiment of company spirit and policy." Foremen, he said, must be selected not only for their technical and economic qualifications, but for leadership abilities.

Wednesday's luncheon speaker was Edward McFaul, self-styled "Roving Entrepreneur," who gave an amusing talk on "How Confused Can You Get?" Thursday luncheon speaker was Rep Harold H Velde (R, Ill), chairman of the House Committee on Un-American Activities, key figure in the recent Harry Dexter White controversy. Mr Velde discussed "Communism—Direct Route to Slave Labor."

Featured speaker at the windup annual dinner Wednesday evening was ex-Notre Dame Dean Clarence Manion, chairman of the Commission on Inter-Governmental Relations who, speaking on "The Constitution Is Your Business," told his audience "basically that is the only business you have."

"The Constitution," he concluded, "is the blueprint for freedom . . . if this can stand, we all can stand against onslaughts launched anywhere in the world."



DISK-TYPE FIXTURE FEEDS MAGNETS BETWEEN TWO GRINDING WHEELS, ejects them automatically via trough to tote tray at G-E Carboloy Dept's Edmore, Mich, plant, where sand-blasted, cylindrical magnets are finish ground on one of 11 disk grinders similar to this one

Metalworking Abroad
(McGraw-Hill World News)

INDIA—The government is considering local manufacture of aircraft engines and tanks, as a means of reducing dependence upon foreign sources. India already produces 75% of its ordnance.

ENGLAND — De Havilland Propellers, Ltd, has acquired a new plant near London for machining hollow-steel blade propellers for turbine-powered aircraft. Plant will employ 150 people, mostly skilled machinists, starting in December, and is expected to be in full production by spring of 1954.

ENGLAND — Britain is losing her century-old Indian market for locomotives to Japan, Germany and Austria. These three nations have obtained orders for 400 locomotives for India, delivery date March 1956. Reason: British, Canadian and US bids were too high.

SPAIN—Ford Motor Co of Spain, acting in conjunction with Ford Motor Co of Dagenham, England, will complete a tractor plant at Barcelona within 30 months. Estimated annual output: 3000 tractors.

PAKISTAN — The Pakistan Industrial Finance Corp has been authorized to extend bank guarantees to importers to obtain machinery on a deferred payment basis. Facilities will be available for imports from Japan, Britain and "certain other countries." The Corporation can guarantee loans, debts and credits to industrial firms, repayable within 20 years.

YUGOSLAVIA — A 420 hp diesel ship engine has successfully passed all tests, will shortly be marketed by Bakaric of Zagreb.

HUNGARY — Lead-bronze bearings are replacing white-metal bearings on all State railway rolling stock here. Bearings are composed of 20-30% lead, 70-80% copper, saving substantial amounts of tin and antimony, which composed about a third of white metal bearings.

BRAZIL—A turbine and water pump manufacturing firm has been established at Sao Paulo by Andritz of Austria. The new company expects to absorb Brazil's present generator producers, incorporating them into the Austrian subsidiary.

LATHE ASSEMBLY HALL at Prvomajska Works, Zagreb, Yugoslavia, the nation's most modern machine-tool plant

Yugoslav Metalworking, Aided by Democracies, at All-Time Peak

BELGRADE — Freed from Soviet domination by the Tito-USSR rift, the Yugoslav metalworking industry is today far exceeding the quota set for it under a five-year plan set up while Russia ruled the Yugoslav roost.

Were Merely Servicing Workshops

Under Russia, Yugoslav metalworking plants operated mainly as servicing workshops for foreign machine tools. Only 5.6% of the country's workers were employed in metalworking, as compared with a 25% average the world over. Then, Russia planned to set up its five-year plan to launch a Yugoslav machine-tool industry, with yearly production of 2500 tons of machinery set as the goal. But two factors killed the five-year plan: (1) the break with Russia and consequent economic blockade by Cominform countries, and (2) Russia's failure to deliver the necessary machine tools.

Democracies Assist

In 1948, following the Tito-Russian break, the Yugoslav government decided to implement its own machine-tool industry, calling upon the Western democracies, mainly the US, for financial help, machine tools and technical assistance. This assistance was quickly and freely given. The result: today, Yugoslavia is producing upwards of 22,000 tons of mining machinery alone annually.

Under Yugoslavia's rebirth of metalworking, many major plants have been built. Noteworthy among them are:

- Ivo Lola Ribar plant, near Belgrade, where more than 2000 workers are engaged in building such heavy machine tools as heavy-duty presses, shears, drilling machines, plus equipment for ironworks and coking plants.
- Rakovica plant near Belgrade, which makes internal combustion engines and tractors.
- The Prvomajska plant, Zagreb, makers of all types of machine tools.
- Djura Djakovic works, Salvonski Brod—steam locomotives, boilers, steel structures.
- Edvard Kardelj plant, Karlovac—steam turbines.
- Litostroj works, Ljubljana—water turbines and pumps, heavy-duty reducer gears, hydroelectric power plant equipment.
- Franc Lekosek works, Maribor—hydro-mechanical equipment.
- TAM plant, Maribor—automobiles, trucks and trailers.
- Trbovlje works — mining hoists, mining transport equipment.
- Tito works, Macedonia — pumps and hydraulic equipment.
- Stup plant, Bosnia — tools and components for engine manufacture.

In addition, many smaller plants have been built for manufacture of ball bearings, textile machinery, well-drilling machines, railway and agricultural equipment.

India's Machine-Tool Builders Report Declining Sales As Government Monopoly Squeezes Market

BOMBAY—India's private machine tool manufacturers are claiming they are being slowly strangled to death by the Indian government's nationalized machine tool industry. The government-owned tool building industry, created in 1948 and financed by government funds, has grown to the point where it is the nation's largest machine tool building factor, far overshadowing private producers.

Designed primarily for the production of ordnance, the government-owned industry today is a colossus that is gobbling up most of the Indian market. Consequently, India's private machine tool building firms report a drop in sales and output and accumulation of huge inventories. For example, in 1950 private industry produced less than a thousand machine tools, contrasted with wartime peak output of 3800.

Other factors enter into the picture. First, Indian consumers are prejudiced against Indian machine tools. Second, the government has placed a number of metalworking items on open general license—a move that has put most of the manufacturers of these items out of business. These same manufacturers were the principal market for Indian machine tools.

One of the chief bones of contention in the private industry-government feud is that the government has entered into a technical assistance agreement with Switzerland's Oerlikon Machine Tool Works, which has a 10% interest in the giant ordnance prototype factory, is permitted to license some machines, and is believed to be engaged in trading in the Indian machine-tool market.

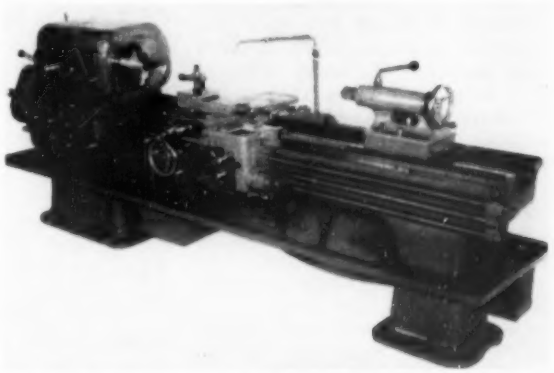
Indian machine tool builders particularly resent the fact that the government is spending millions in cooperation with a foreign enterprise, letting its own machine-tool industry go to pot.

Private Indian manufacturers, apart from lack of capital, must cater to a widely differing market — with customers who want inexpensive job shop machines and with consumers who insist on high-speed high-production machines.

To cope with this, a certain amount of specialization is being undertaken. As examples: Investa Corp is scheduling manufacture of radial drills and drilling machines; Mysore Kirloskar is going in for lathes; and the Ambranath Prototype factory will soon make grinders and buffers.

New machine tools in production include high-speed lathes up to 8½-in. swing, plain and universal milling machines, fully geared head pillar drills. Planned for production soon are high-speed lathes with 9½-in. swing, hydraulic shapers, 5-ft radial drills.

But in spite of new products and greater specialization to meet local demand, expansion of India's privately owned machine tool industry is stymied, at least until the government begins to share its over-large portion of the Indian metalworking market, or until the Government recreates a market among Indian industries.



INDIAN-MADE ENGINE LATHE is built by Mysore Kirloskar at Harihar, one of India's 15 top machine-tool builders

LEFT: grinding machines in the main workshop at the Ambarnath Machine-Tools factory, near Bombay. This plant was officially opened by Prime Minister Nehru in January

RIGHT: light and medium milling machines in various stages of completion at the Ambarnath plant

T G Barnes

J T O'Brien

David Shipley

John H Harding

Names in the News

T G Barnes has been elected vice president, sales, and **J T O'Brien,** vice president, operations, of Firth Sterling, Pittsburgh. Mr. Barnes, associated with Reynolds Metals for four years, joined Firth Sterling as production manager, and was general sales manager at the time of his election. Mr O'Brien, for many years with US Steel Corp, has been works manager in charge of all operations since 1951.

Richard N Rusch has been promoted to the post of New England sales manager of Acme Welding, division of the United Tool & Die Co, West Hartford, Conn. He was formerly sales engineer, and has devoted the past fifteen years to weldment design and the supervision of all types of welded fabrication.

John C Keplinger has been elected president of Hercules Motors Corp; he succeeds **Charles Balough,** named chairman of the board after serving as president and general manager since 1929. Mr Keplinger joined the company as sales manager in 1926; he was made a vice president in 1932, a director in 1934, and has been serving as executive vice president of the company since 1948.

Daniel S de Rimini has been named general sales manager of Anton Smit & Co, New York manufacturers of industrial diamond tools, wheels, and drill bits. **Frans L Meyjes** has been appointed vice president in charge of production and director of the applications engineering division, and **Oscar A Tellier** has been named treasurer.

David Shipley has been appointed sales manager of Marvic, Inc, San Mateo, Calif, manufacturers of the Lathemaster 4-faced toolblock and toolholders.

Carleton Ellis, Jr, has been appointed director of sales for all Plaskon products, recently added to the line of phenolic resins produced by Allied Chemical & Dye Corp's Barrett Div. Allied purchased the Plaskon Div of Libbey-Owens-Ford Glass Co, Toledo, in October. **Sam Gurley,** formerly Barrett resin sales manager, has been named general sales manager; **H W DeVore** is manager of molding compound sales; **H A Raymond, Jr,** manager of industrial sales; **C D Delaney,** manager of coating resin sales.

Carl Hammon has joined the engineering staff of Erie Foundry Co's Hydraulic Press Div. Mr Hammon has been associated with the Watson-Stillman Co, Roselle, NJ, for the past eighteen years.

Manley E Lord, manager of General Electric Co's Fractional Horsepower Motor Dept in Ft Wayne, Ind, has retired after 45 years of service with the company. Mr Lord was made works manager of the Ft Wayne plant in 1939, and eight years later was named head of the department.

Thaddeus Augustyn has been named vice president of American Research Corp, Bristol, Conn. He recently resigned as works manager of Bowser Technical Refrigeration, where he had been actively engaged in the development of environmental test equipment since 1946.

John H Harding has been named sales manager of Hydro-Line Manufacturing Co, Rockford, Ill. Mr Harding joined the company in 1951 as sales engineer.

J H Jewell, vice president, Westinghouse Electric Corp, Pittsburgh, Pa, has been elected president of the National Electrical Manufacturers Association. He succeeds **L G Hall,** president of Stackpole Carbon Co, St Marys, Pa. Vice presidents elected are: **J L Busey,** vice president, General Electric Co, New York; **J W Corey,** president, The Reliance Electric & Engineering Co, Cleveland; **W A Elliott,** president, Elliott Co, Jeannette, Pa; **F F Loock,** president, Allen-Bradley Co, Milwaukee, Wis; **Hoyt Post Steele,** executive vice president, Benjamin Electric Mfg Co, Des Plaines, Ill.

Robert A Horner has been appointed divisional manager of the machine and small tool divisions of Barber-Colman Co, Rockford, Ill. **Leo W Reuland** succeeds Mr Horner as sales manager, and **Fred B Jensen** takes over Mr Reuland's post as production manager.

H Sturgis Potter has been named vice president in charge of sales, of Carpenter Steel Co's Reading, Pa plant; he moves up from his post as general sales manager. **Arlington A Britton, Jr,** formerly general superintendent of the Reading mill, has been elected vice president in charge of production. **John Moxon,** formerly secretary and treasurer of the firm, has been appointed vice president, treasurer, and secretary.

Leonard J Edwards has been appointed vice president in charge of sales for C I Hayes, Inc, Providence, RI, manufacturers of electric heat-treating furnaces.

A William Tilder

Felix W Saco

Henry M Aldrich

Robert T Collins

A William Tilder has been appointed sales manager of Lamina Dies & Tools' Guide Pin & Bushing Div. Prior to joining the firm, Mr Tilder was vice president and general manager of Acromatic Tool Co, Detroit. He will make his headquarters in Berkley, Mich.

E L Casey has been appointed vice president, operations, Scaife Co, Oakmont, Pa. Mr Casey was formerly associated with Mullins Mfg Corp, Salem, Ohio, and prior to that, held posts with E W Bliss Co, and the Atomic Energy Commission.

Robert Shattuck has been elected president of Marbon Corp, Gary, Ind, subsidiary of Borg-Warner. He succeeds **George P F Smith** who is retiring from the post to devote full time to his duties as president of the Norge Div of the parent company. Mr Shattuck joined Marbon in 1942 as assistant general manager, and was named vice president and general manager in 1944. **H Hunter Gehlbach,** assistant secretary and assistant general counsel of the company has been elected secretary of the subsidiary. **E R Meyer** has been named treasurer and assistant secretary.

Henry L Pohndorf has been appointed sales manager of National Welding Equipment Co, San Francisco, Calif. Mr Pohndorf has been the Company's chief engineer since joining the staff seven years ago. He will retain this post in addition to his new duties.

A W Morgan has been appointed executive vice president and general manager of Pachmayr Gun Works, Inc, Los Angeles manufacturers of parts for major aircraft firms. Mr Morgan was formerly general manufacturing manager of Convair's San Diego division.

Felix W Saco has been appointed development engineer for Permutit Co, New York. Mr Saco joined the firm's engineering department last year.

Henry M Aldrich has been appointed director of sales of Daco Machine & Tool Co, Brooklyn, NY. Mr. Aldrich was formerly associated with Reeves Instrument Corp as divisional sales manager.

H M Scherling has been appointed representative of Detroit Die Set Corp for Minnesota and western Wisconsin. He will make his headquarters in Minneapolis.

F Pat Greene has been appointed general sales manager of Newman Industries (America) Inc, British manufacturer of electric motors, with general offices in New York. He will be responsible for establishment of a national distribution organization in this country. Mr Greene was associated with Gardner Denver Co for 23 years in sales management work, and more recently with Chicago Pneumatic Tool Co.

Thomas D Nast has been made president of All-State Welding Alloys Co, White Plains, NY. Mr Nast has been a director and secretary-treasurer since the company was founded in 1946; he succeeds **Bent Laune,** who has resigned.

Charles W Snyder has been named a district sales manager for DeWalt, Inc, subsidiary of American Machine & Foundry Co. His territory will include Delaware; New Jersey, from Trenton south; and Pennsylvania, from Lewistown east. Mr Snyder joined the firm in 1939; in 1947 he was appointed head of the company's metal cutting machinery and special installations division.

Robert T Collins has been named general sales manager of General Motors New Departure Div; he succeeds **Charles D McCall,** appointed manager of automotive engineering in the division. Mr Collins moves up from his post as manager of the Meriden, Conn, plant; he has been associated with the division since 1941, and has held his most recent post since May 1951.

Larry Eigenrauch has been named sales manager of Bendix Aviation Corp's Eclipse-Pioneer Div Foundries. **Willard Neuert** succeeds Mr Eigenrauch as production manager.

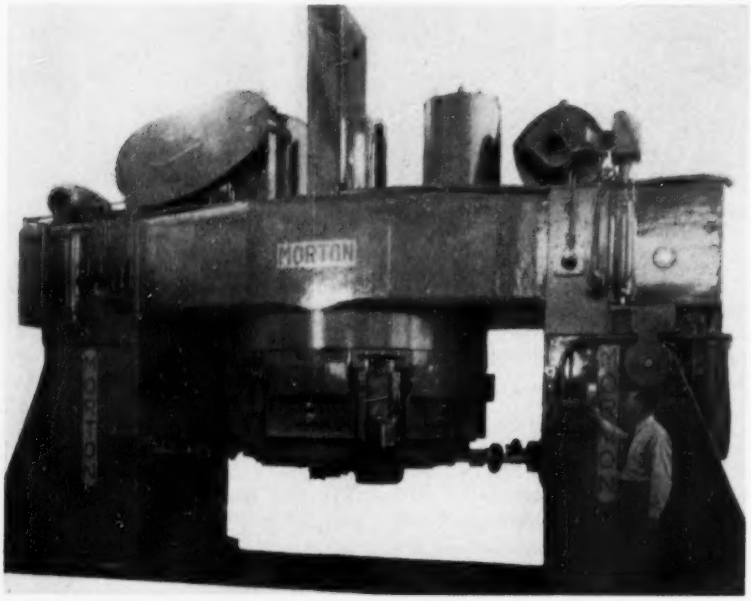
Samuel H Greenwood has been named district manager of F J Stokes Machine Co's newly enlarged territory with headquarters in Philadelphia. Formerly manager of extruder sales, Mr Greenwood is now in charge of sales and services for all Stokes products in eastern Pennsylvania, upstate New York, lower New Jersey, Delaware, and the southeastern states extending as far as Florida.

OBITUARIES

Glen H Matthews, 62, sales manager of metalworking machinery of Mattison Machine Works, Rockford, Ill, died Nov 14. He had been associated with the company in various sales capacities for 29 years.

James H King, 61, vice president and director of The Babcock & Wilcox Co, New York, died Nov 14 in New Rochelle, NY. Mr King joined the company in 1914; he was appointed manager of the Marine department in 1931, elected a vice president of the company in 1945, named head of the Boiler Div in 1952, and became a director of the firm last April.

New Shop Equipment



Heavy-Duty Bridge-Type Machine Does Large-Diameter Boring

Bridge-type inverted boring machine is specially designed for heavy-duty roughing and finishing operations on large-diameter bores. It was developed to machine the turret ring bore in Army tank hulls and the ring bearing on bottom of turret. These operations are performed with hull in traveling position and turret in inverted position.

The 96-in.-diameter boring head and supporting bridge are lifted hydraulically to provide clearances for the part to be moved in and out of machine on traveling fixture. After part is positioned, bridge is lowered and locked to columns.

Boring head is equipped with six toolslides. Each toolslide has independent adjustable feed. Toolslides may be arranged for boring or facing; they may also be angle-mounted for taper boring.

Special toolblocks are attached to slides to carry standard carbide-tipped toolholders; they are specially designed to provide specific cutting operation required and are provided with adjusting means so they can be pre-adjusted when tools are ground. Stops determine final size of finished part.

Morton Manufacturing Co, Broadway & Hoyt, Muskegon Heights, Mich

Taylor Develops High-Quality Phenol Plastic Laminates

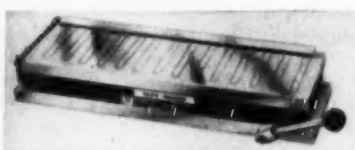
The Taylor Fibre Co has introduced two new series of laminated plastics after 16 months of intensive research and development. XXXP-300 series provides high insulation resistance and meets rigorous staking and punching requirements; it is a hot-punch (135 C) material. XP-400 is a cold-punching laminate said to afford new opportunities for uniformity in fabrication.

XXX-300 and 301 have the following properties: (figures relate to NEMA standards) Water absorption is less than 0.5; tensile strength is 13,000 psi; Rockwell hardness on M scale, 105 and 108; pf (cond A), 0.027 and 0.026 at 1 MC; dielectric constant, 3.72 and 3.55; short-time dielectric strength (vpm), 800 and 920; insulation resistance, 300,000 megohms; flame retardance in seconds (full width) 8 and 34. Sheet size is 49x49 in.; thickness for punching is 1/16 in.; tool range is up to ⅛ in.

XP-400 has water absorption of 0.7, tensile strength of 12,000 psi, hardness of 80, dielectric strength of 698, and flame retardance of 2 seconds. Sheet size is 49x49 in.; thickness, 3/32 in. for cold punch and shear; range to 3/32 in.

Additional grades will be developed in both series and attention will be given to increasing the applications of the laminates to such fields as printed circuitry.

Taylor Fibre Co, Norristown, Pa



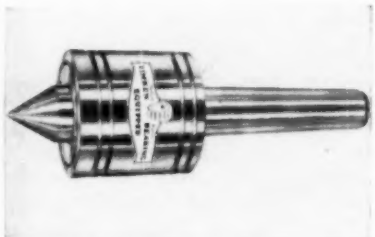
Permanent Magnet Chucks Feature Lower Height

Taft - Peirce permanent - magnet chucks are compact and 15 to 20% lower in height, according to the manufacturer. Incorporation of more magnetic poles in relation to chuck length makes possible a greater effective work-holding area.

Hoiding power is controlled by progressive positioning of hand lever. Chuck operates without heat.

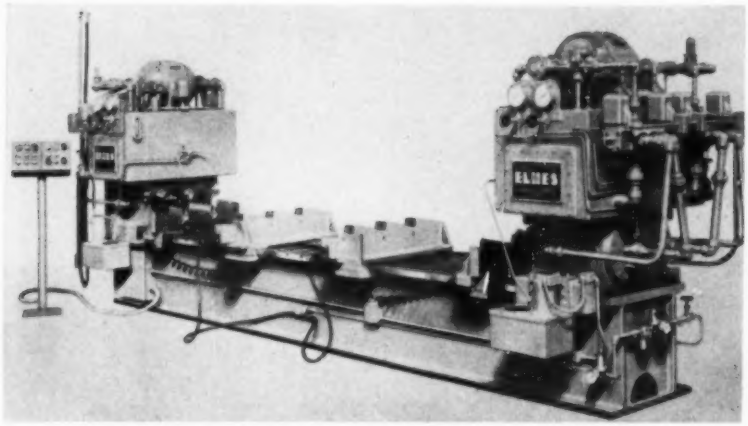
Units are portable for use in surface grinding, light milling, planing, shaping, and inspection or test purposes.

The Taft-Peirce Mfg Co, Woonsocket, RI



MONARCH LIVE CENTER, equipped with No. 3 Timken bearings, has a guaranteed accuracy of 0.0001. Interchangeable points are available in a wide variety of sizes for standard male, long male, standard female, and standard pipe points — *Royal Products, 82 Union St, Mineola, NY*

Materials and Parts



Automatic Hydraulic Press Reduces Both Tube Ends in One Operation

Elmes double-end tube-reducing hydraulic press reduces both ends of a tube simultaneously. It will accommodate tubes varying in length from 3 to 12 ft in 6-in. increments.

To prevent tube-buckling, machine has two stations and uses a preliminary-reduction as well as final reduction die. These dies are mounted internally in each ram with an internal automatic hydraulic knockout. As the ram returns after the reduction, the knockout automatically ejects the tube.

Different-length tubes are handled by moving one cylinder block, with accompanying pumping unit and controls, along the bed by means of a motor-driven leadscrew. Keys across the bed take the thrust load. Tubes are fed automatically through the machine. To eliminate any tendency of longer tubes to bow, air-operated clamps are used.

Tube ends are lubricated prior to reduction by two lubricant pumps and reservoir units, one at each end of press.

The press is fully automatic in operation and capable of producing at rate of 150 tubes per hour.

American Steel Foundries, Elmes Engineering Div, 1150-A Tennessee Ave, Cincinnati 29, Ohio

8-ft Press Brake Added to Semco Line

Model 800 has overall height of 79 in., depth of 44 in. The distance from floor to bottom of throat is 30½ in.; stroke is 3 in.; ram adjustment is 4½ in.; strokes per minute range from 16 to 40. Bending capacity for 16 gage is 96 in.

Press brake is reported to have unusually strong construction and high precision.

Service Machine Co, Inc, Elizabeth, NJ

Industrial Wiper

Scott Paper industrial wiper is packaged in compact size box containing 125 wipers. Each wiper consists of two sheets which are welded together for durability. Chemical treatment creates wet strength. Wipers are paper, disposed after use.

Scott Paper Co, Chester, Pa

... INCLUDING

Skin milling machines mill aircraft wings and other structural sections from solid aluminum plates; table travel is 24 ft page 192

Automatic press brake control enables setting ram to stop at any point in downstroke by knob adjustment page 193

Seven-roll straightening machine handles rolls with diameters from 3⅝ to 12 in. .. page 194

Tempering and flattening furnace is completely self-contained unit with three sections of pressure plates and three doors. .page 195

Shell-molding machine, with gas or electric curing oven, produces two parts per minute page 196

Automatic welding machine uses motorized pedestal with 96-in. travel and 360° rotation page 198

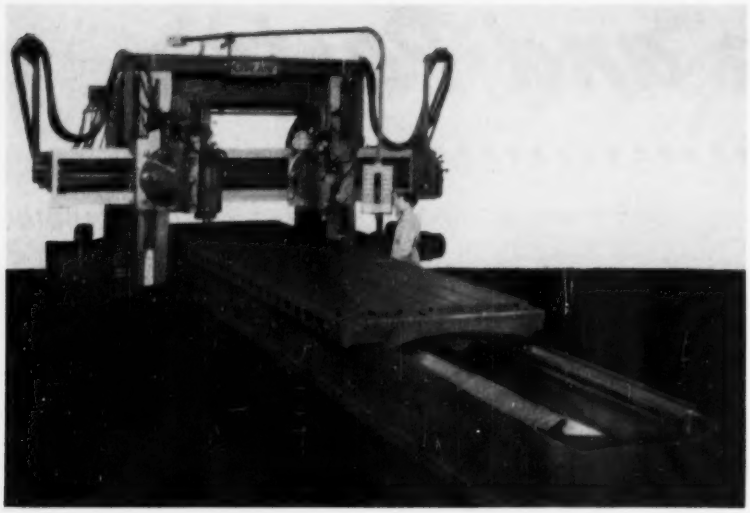
Visual gage accessory quickly classifies ball bearings into one of ten dimensional classifications page 202

Multiple surface plate composed of two or more plates on single stand providing means of alignment ..page 204

... and in Dec 21

Gear analyzer provides magnified image of gear as it rotates in contact with a composite rack chart.

Surface measuring instrument has range from 1 to 1000 mu-in. deviation from mean surface and separates waviness and roughness characteristics.



Special Gray Machines Mill Aircraft Structural Members

These machines mill aircraft wings and other structural sections from solid aluminum plates up to 4-in. thick. The model illustrated allows a table travel of 24 ft, has a work height maximum of 42 in., and 84 in. between the uprights. It was recently delivered to North American Aviation, Inc. The largest machine delivered to date has a 30-in. table travel.

The design features two 50-hp, 3450-rpm Onsrud heads. Both rail heads swivel 20° to either side of vertical. In addition, the left-hand head rail will swivel to 15° forward or back of vertical.

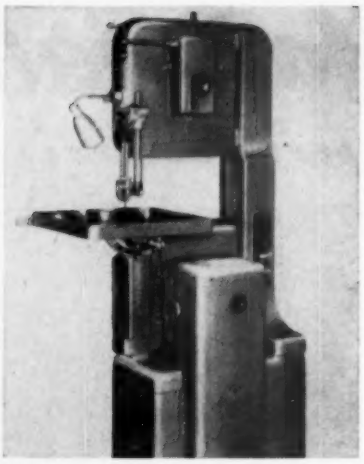
A pneumatically actuated device permits instantaneous quill retraction of 1½ in. The quills are accurately repositioned with the use of a micrometer adjustment. Vertical adjustment of the heads is possible to the extent of 4 in.

The recurrence of certain specified angles led to the development of positive gear combinations to insure accurate automatic synchronization of head and table feed. A specialized pendant station, mounted on antifriction bearings and carefully counterbalanced, segregates table and head movement controls. Separate feed motors may be varied, reversed, or stopped from the pendant station. Table-feed ranges from 0.7 to 180 ipm.

Non-metallic table, saddle, rail, and gib bearings are used throughout. These bearings are said to be particularly important because they guard against scoring and scratching during continuous operation. The spindle is actually the motor armature.

The large aluminum plates are secured by vacuum chucks mounted on the machine table. Provision is made for securing full-size templets to the machine. With the pendant-station control, the operator can "steer" the machine to follow the templet closely and generate the wide variety of shapes required.

The G A Gray Co, 3611 Woodburn Ave, Cincinnati 7, Ohio

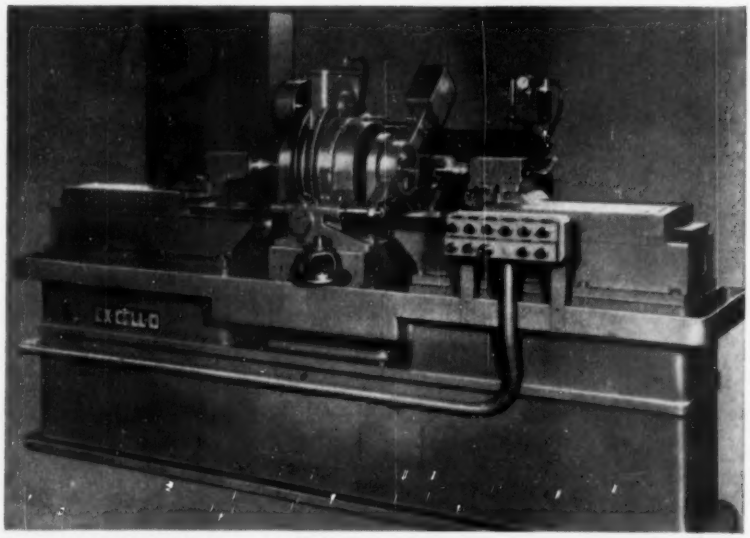


Bandsaw Speed Range From 50 to 4500 sfpm

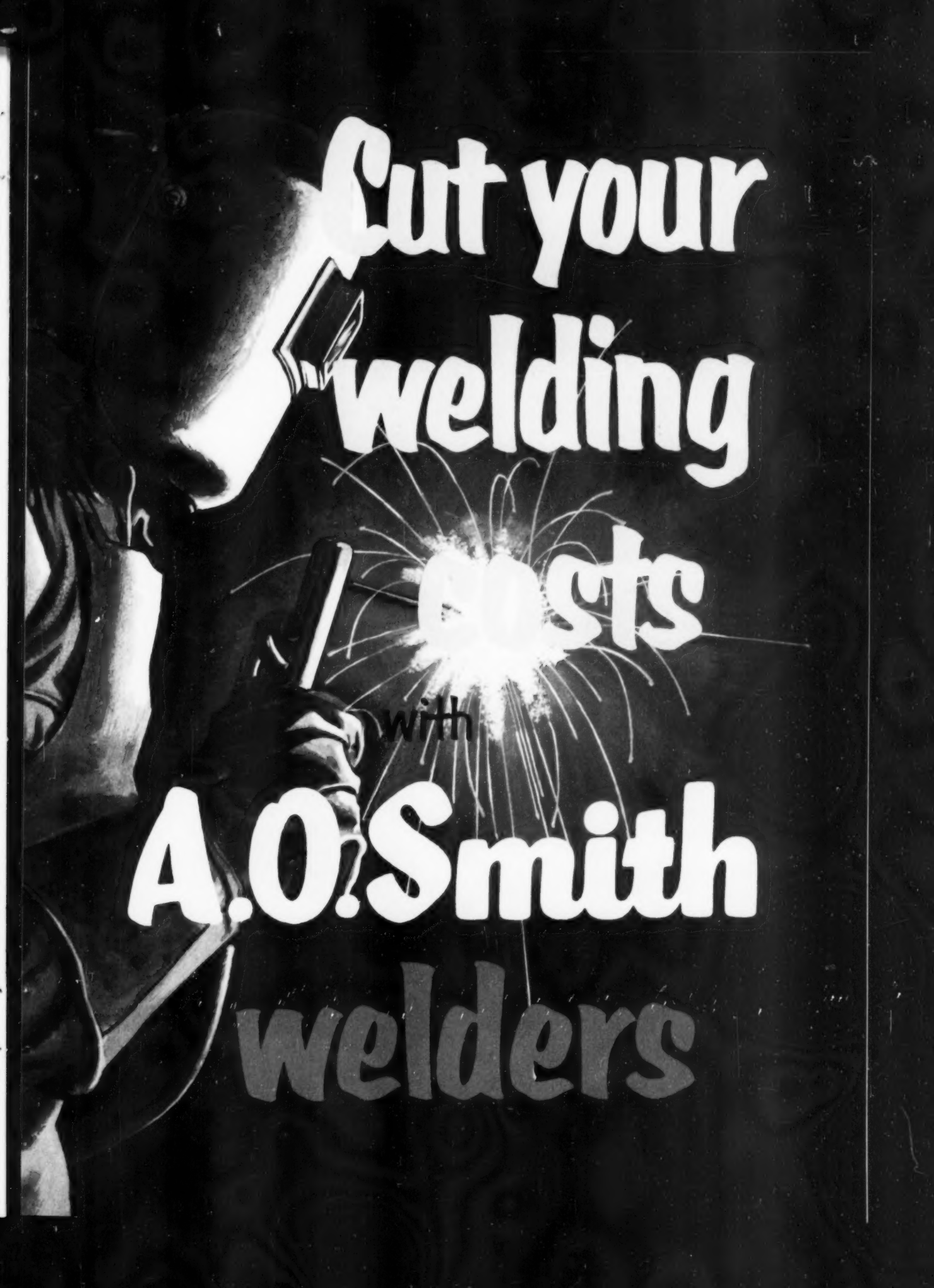
Variable-speed bandsaw with 16-in. capacity effects speed change through a handwheel operating a variable-diameter pulley which is connected to a saw wheel through a gear train. The low speed range operates from 50 to 450 sfpm, the high range from 500 to 4500 sfpm. Two-position lever selects the speed range.

Capacity under the guide is 8 in. The table tilts 45° to the right and 5° to the left. The motor is spring-mounted in the base. Motor recommended is ¾-hp, 1140 rpm.

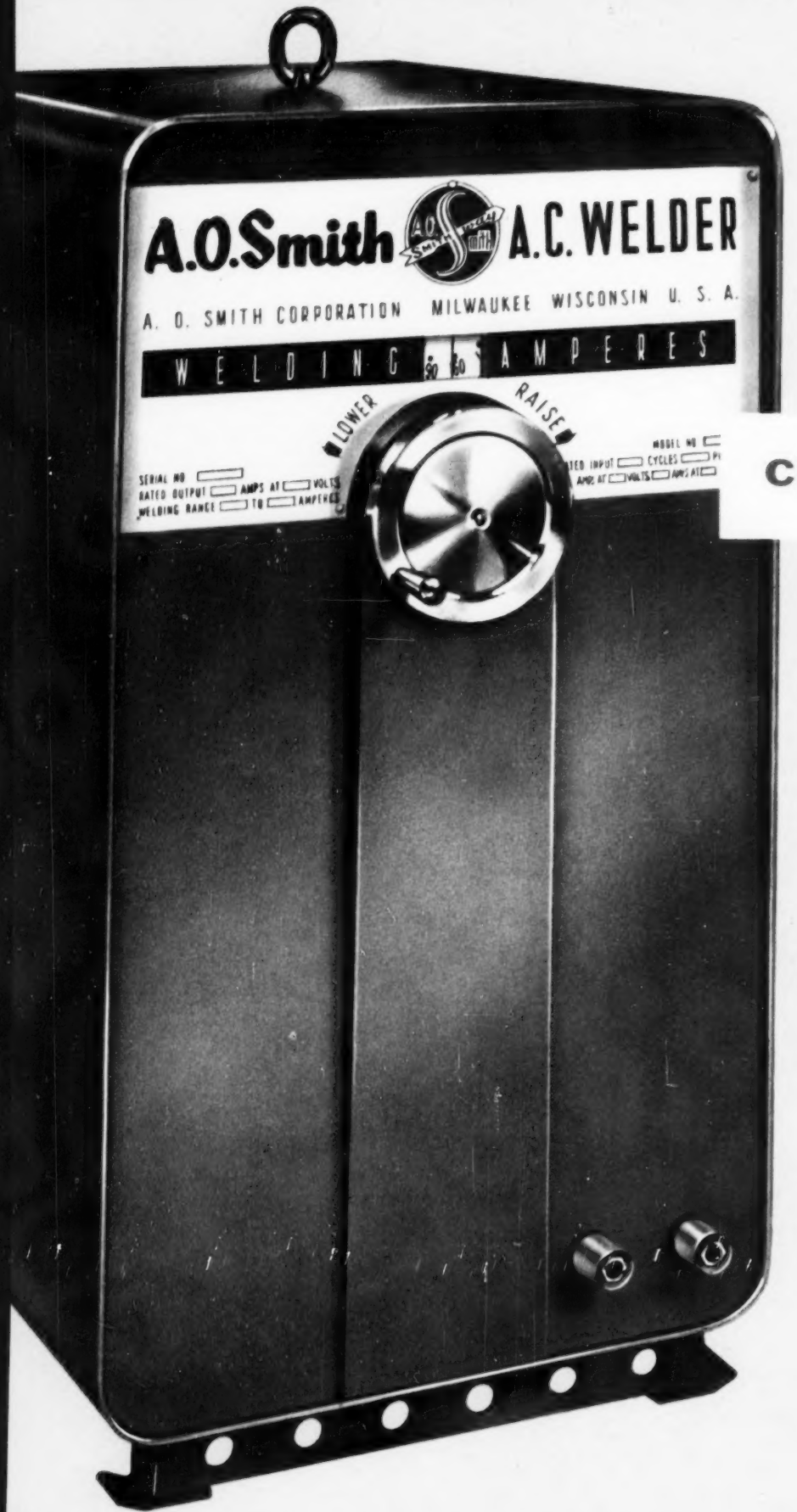
Walker-Turner Div, Kearney & Trecker Corp, Plainfield, NJ



BACK-COUNTERBORING OPERATIONS are performed on automotive differential cases by this special machine which eliminates handling of the cutter before and after each cut. Toolslides at each end carry single-point tools for back-counterboring, facing, and boring in an automatic cycle. Parts are loaded manually, clamped hydraulically by a live bearing clamp, and automatically unclamped. Central slide positions work so tools can be inserted, and also feeds work during facing cuts — *Ex-Cell-O Corp, 1200 Oakman Blvd, Detroit 32, Mich*


Cut your
welding
costs
with
A.O.Smith
welders

...and get all the



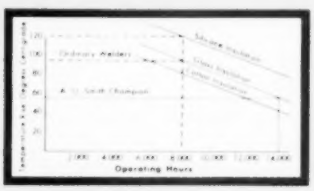
A. C. CHAMPION

heavy-duty welder

Designed and long proved the most dependable power source for continuous operation on the most demanding welding assignments at full rated output.

The CHAMPION has enough copper, plus downdraft ventilation, to assure no more than a 55° C. temperature rise when operating at full rated output. This means almost twice the operating life of any comparable heavy-duty welder!

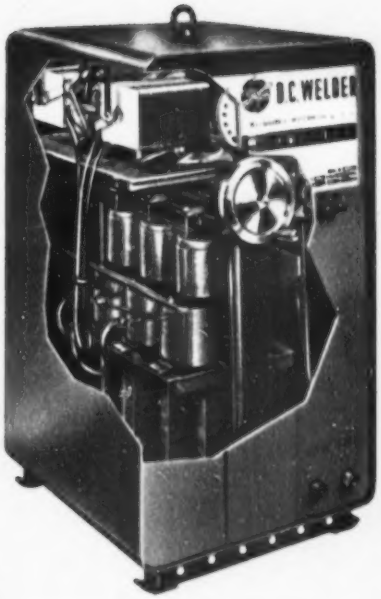
75 open circuit volts for high-speed welding with a faster and smoother arc! You can "drag the arc" on rapid work and weld low-hydrogen electrodes without "pop-outs." All-weather case makes it as useful outside as in the shop. Available in 300-, 400- and 500-amp models.



The **A. C. UTILITY** for farms, garages, machine shops with dual welding range: 25-90 amps., 35-180 amps.

extra benefits

which A. O. Smith design and engineering provide!

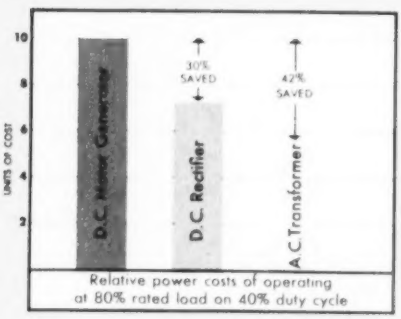


D. C.
RECTIFIER
heavy duty welder

Here is a complete line of N.E.M.A.-rated welding power sources that operate without a single, heavy, rotating part! No motor (other than ventilating fan) and no generator . . . nothing to wear, no commutators to corrode or turn down, no bearings or brushes to replace! Yet they provide a better welding current for all types of work, and operate with unmatched efficiency!

SAVE POWER

Power costs of operating 400-amp. welders are charted below, providing an opportunity to compare motor-generator, rectifier, and AC transformer demands on 40% duty cycle.



Relative power costs of operating at 80% rated load on 40% duty cycle

The savings in power effected by transformer type machines over motor generators result from the improved efficiency under load of the A. C. transformer (85% to 88%) and the D. C. Rectifier (69% to 72%) over the D. C. Motor Generator (45% to 50%), plus the ability of transformer and rectifier to deliver full welding current instantly, when demanded, without requiring large idle-time power to keep rotating parts in motion. The savings are real. In fact, many manufacturers have found that a new transformer will practically pay for itself in a year! Ask your A. O. Smith distributor or representative to show you how, at your next opportunity.

SAVE OTHER COSTS

You save more than power costs when M.G. sets are replaced by A. O. Smith welding machines. Rectifier and transformer welding current inherently has less arc blow, and that means higher quality welds, faster welding speeds and less spatter. It also means greater overall operator efficiency, which assures better weldments, less weld repair and gives the operator greater pride in his work. The result: more money saved and production improved!

Because there are no moving parts, A. O. Smith welders require practically no maintenance. Quiet in operation, they are built to stand up under gruelling production schedules.

Modern successor to the cumbersome, troublesome, lumbering motor-generator set! This welding power source provides smoother arc performance, more dependable amperage at all times, instant striking arcs, and uses power only when welding! It's the only rectifier-type welder designed with high-velocity down-draft ventilation, which draws cool air in over the rectifier stacks before blasting it through the machine. Even when short-circuited at full rated amperage setting, the rectifier stacks remain below critical temperature! Stepless amperage control, effortless and accurate over the full range, assures exactly the desired setting for any job. The three-phase transformer coils are precision wound, of heavy copper, for long service life. Available in 200-, 300- and 400-amp. models.

The **A. C. CHALLENGER** all-purpose welder 200-, 300- and 400-amp. models

The **A. C. AUTO-MAN** for automatic or manual use 650-amp. model, up to 4 unit multiples available

There are A. O. Smith welding power sources for every welding need, built to the highest standards in the industry and of advanced design that makes them more desirable than any other make. Job proved in the shops of the world's largest user of welding as a production tool!

It will pay you to replace M.G. sets with A. O. Smith welders. May we suggest that you write us or contact your local A. O. Smith distributor for full particulars.

A.O.Smith
CORPORATION

WELDING PRODUCTS DIVISION, Milwaukee 1, Wisconsin

INTERNATIONAL DIVISION: MILWAUKEE 1, WISCONSIN

Highest Quality Welding Electrodes

Mild Steel	AWS Class	E6010	E6011	E6012	E6012	E6013	E6013	E6020
	A. O. Smith	SW10	SW14	SW11	SW17	SW15	SW16	SW35

High Tensile	AWS Class	E7010	E7010	E7020	E8013	E9010	E9013	E10013	E10020
	A. O. Smith	SW75	SW89	SW76	SW86	SW95	SW87	SW88	SW101

Low Hydrogen	AWS Class	E6016	E6016	E7016	E8016	E9016	E9016	E10016	E12015	E12016
	A. O. Smith	SW64	SW65	SW84	SW81	SW90	SW89	SW100	SW120	SW103

Stainless	AISI Class	502	505	410	430	308	308	309	309	310	310	310	310	310	316	317	318	347	347
	A. O. Smith	SW151	SW152	SW153	SW154	SW162	SW362	SW166	SW167	SW159	SW359	SW169	SW168	SW368	SW160	SW161	SW158	SW157	SW357

Complete line of welding accessories

All the essentials to put welding to work are available through A. O. Smith. Quality welding cable, connectors, splicers, ground clamps, tongs, and holders; helmets, shields, gloves, and protective clothing; electrode storage ovens, machines and electrodes ... everything required for welding can be had from one responsible source. Take advantage of this for all your welding needs.

A.O.Smith

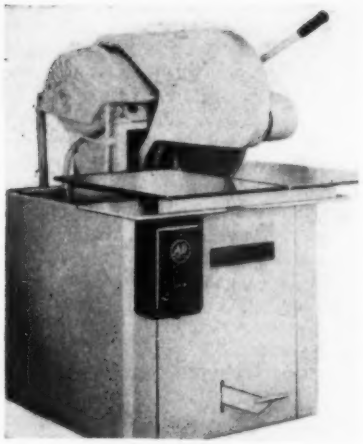
CORPORATION

WELDING PRODUCTS DIVISION

Milwaukee 1, Wisconsin

INTERNATIONAL DIVISION: MILWAUKEE 1, WISCONSIN

Made by welders . . . for welders



Saw Converts to Foundry Or Chop-Stroke Operation

Heavy-duty cutoff saw offers versatility. By attaching the foundry bed and locking the cutter head, unit is adapted to gates and riser cutting. By reversing this operation, saw reverts to chop-stroke operation for cutting bars and shapes.

Saw power is 7½ or 15 hp and permits use of 18- and 20-in.-dia cutoff wheels. Other features include: large throat room, safety guard covering entire wheel before cut starts, foot-operated V-vise hold-down, and heavy-duty spindle bearings.

Henry H Wise Co, 945 Wilshire Blvd, Los Angeles 17, Calif

Automatic Press Brake Control

With this control the ram of the press brake can be set to stop automatically at any point in the down stroke by knob adjustment of the predetermined stop. Complete operation is controlled by master control panel.

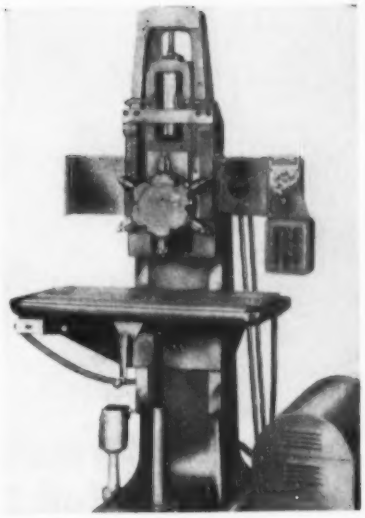
There are no large pedals or levers to manipulate and no special skill required. With predetermined stop the ram will remain in position until the operator presses a switch again.

The automatic control consists of four components: control panel, solenoid, foot switch and automatic switch box tied in with the stroke of the ram. The unit can be readily mounted on any press brake.

Ram is set to stop at any point in the down stroke; operator presses foot switch and ram descends and stops. When foot switch is released and pressed again, ram follows through to end of stroke and returns to top position automatically. It is not necessary for the ram to reach uppermost position; sheet can be removed while the ram raises itself.

Double clutching is accomplished by slipping a switch in the panel board; same board can be set up for variety of operations. Press brake can be used manually if so desired.

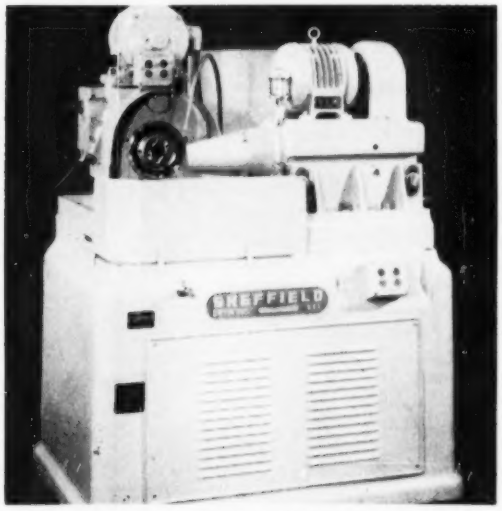
American Actuator Corp, 40 Hudson St, New York 13, NY

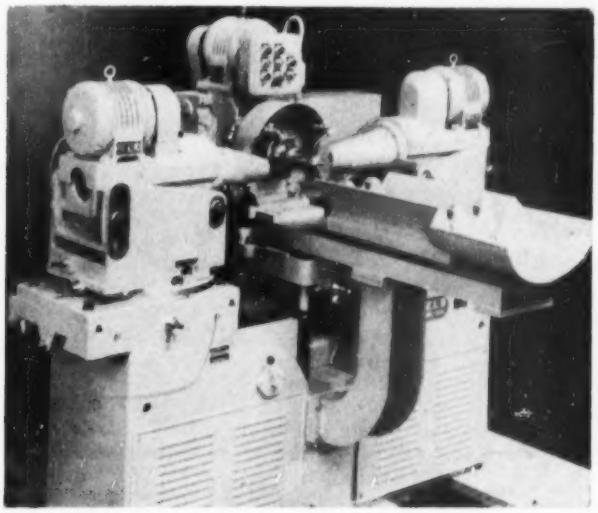


Six-Spindle Turret Drill Has Twelve Spindle Speeds

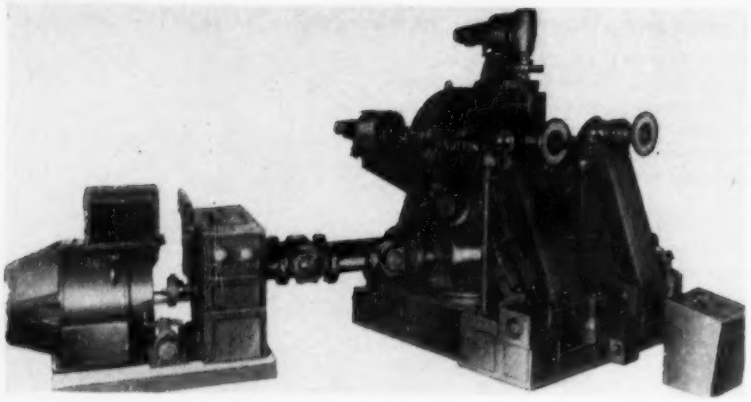
Burgmaster model 2BH features infinitely variable hydraulic feed that can be manually controlled for automatic operations. Machine incorporates features of model 2A. Infinitely variable feeds will meet exacting specifications. Each spindle has 12 preselective speeds. Table travel is 19 in.; positive depth stops can be easily set; skip indexing will save time.

Burg Tool Manufacturing Co, Los Angeles, Calif





GEAR BURRING AND CHAMFERING MACHINES in the series 340 (left) and series 360 (right) class were designed to round, chamfer, or point the ends of gear teeth, particularly those used in reciprocating and jet-aircraft engines. They may be used to mill a desired contour on gear tooth ends. Within the series are single and double machines employing Sheffield's patented feature allowing use of either hollow mill or pencil type of chamfer on same machine. Even-numbered machines are for small lot production of gears of same pitch but varying number of teeth. Odd numbers classify high-production machines. Gears up to 13 in. are handled on these machines and chamfering operations are performed at the rate of 300 teeth per minute on spur, helical, or bevel gears. On the left is machine No. 341 for long-run production. Machine on the right is No. 360 handling both sides of gears simultaneously or one side of a spline in two places 180° apart—*The Sheffield Corp, Dayton 1, Ohio*



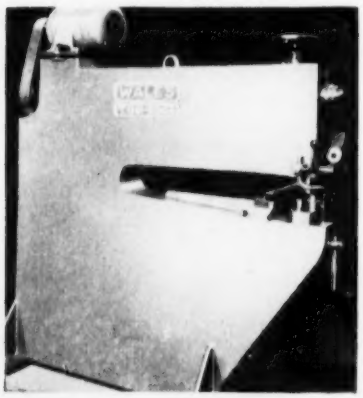
Seven-Roll Straightener Uses Cluster Roll Setup

Accurate end-to-end straightening is said to be assured by advanced roll arrangement in tube and bar straightener employing seven-roll principle with cluster-roll arrangement. Machine is designed for tubes with from 3⅝ to 12 in. OD's and bars from 3⅝- to 7½-in. diameters.

Large driven roll with two opposed idler rolls is located at entry end of the machine; identical cluster is at delivery end. In these clusters rolls are positioned at approximately 120° to each other. Between these three-roll clusters is an unopposed pressure roll. The arrangement eliminates use of old guides.

Centralized control panel gives operator ability to guide overall straightening operation from single pulpit.

Sutton Engineering Co, Bellefonte, Pa



Wales Tru-Edge Shear Has Capacity to 9/32-in. Steel

Giant Model shear is designed for contour and straight inside and outside shearing, beading, louvering, and joggling. New shearing principle is said to eliminate resistance to feeding and turning work. Also, feeding of material may be started while ram is operating. Inside cutting requires no starting holes.

Cam design reportedly provides vibrationless operation. Material is not punched but sheared to provide smooth edge. Adjustable bottom-shearing die is set for various thicknesses of material. Capacity is up to 9/32-in. thick mild steel. Throat depth is 36½ in. Cutting rate is from 10 to 36 fpm.

Wales-Strippit Corp, 345 Payne Ave, N Tonawanda, NY

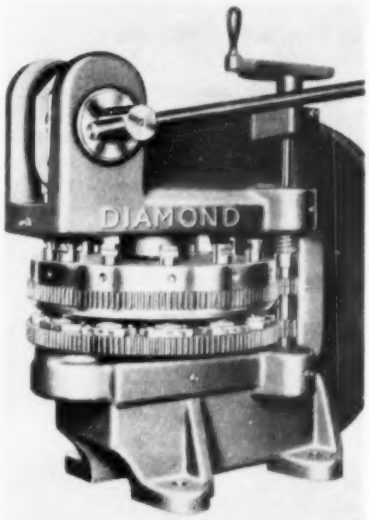
Lincoln Hardsurfacing Process Uses New Granular Fluxes

The alloy content of the deposited metal is supplied by an agglomerated granular flux, rather than by the electrode, in this new process for automatic hardsurfacing developed by Lincoln Electric Co. Automatic hardsurfacing can be applied with conventional mild steel electrode by substituting, for the mild steel flux normally used, the new hard surfacing flux. Any standard automatic welding head may be used without changes. By diluting the hard surfacing flux with mild steel flux, hardsurfacing properties can be matched exactly to service requirements.

Two hardsurfacing fluxes are available. Flux H-545 is for use when a smooth layer of good abrasion resistance and high impact strength is required. H-545 weld metal is an alloy of carbon, manganese, silicon, chromium, molybdenum and vanadium. Deposit is magnetic at room temperature and with recommended procedures has a hardness of 53-57 Rc. Flux H-550 is for extremely abrasion-resistant deposits with good impact strength. H-550 weld metal is an alloy of carbon, manganese, silicon chromium and molybdenum. The deposit is magnetic, semi-austenitic at room temperature, and has a hardness range of 36-62. Deposit is nonmachinable.

Both hardsurfacing fluxes can be used with a medium to high carbon electrode as well as with a mild steel electrode. Changing electrode core wire analysis along with varying the flux mixture extends further the range of service requirements. Electrodes are available in sizes ranging from 7/32 to 3/16 in. in coil form.

Lincoln Electric Co, Cleveland 17, Ohio



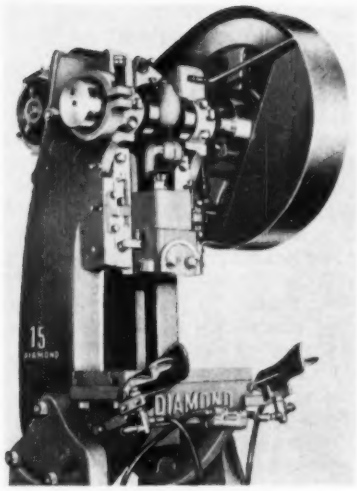
Punch Press Indexing Control Automatically Positions Die Sets

Diamond Machine Tool has redesigned its hand-operated turret punch press to incorporate a punch indexing control for automatic exact positioning of die sets. Punches and dies are geared together.

Turret has 13-in. stroke and contains 12 punches and dies interchangeable between turret positions. Capacity is 10 tons and max punch size is 1½ in. with ⅛-in. mild steel. Punch diameter is 3/16 in. in ¼-in. steel.

Turrets are geared together with self-compensating gears to eliminate backlash. Ram is actuated by generated cam which delivers variable ram pressure. Minimum deflection and maximum punch life are obtained through use of 600-lb frame. Interior is lighted to permit easy spotting of pilot holes or center punch marks.

Diamond Machine Tool Co, 5511 Coffman-Pico Rd, Pico, Calif



Diamond Redesigns 15-Ton Punch Press

Continuous or single-stroke operation is available on the redesigned Diamond 15-ton open-back inclinable punch press with shut die height of 9 in. Press was redesigned to meet strict safety codes. Metal guard completely covers the flywheel. Frame is of Meehanite casting, properly aged under natural conditions, designed to rigid specifications of strain gage analysis.

Standard stroke is 2 in. with strokes available on order up to 4 in. Bed area is 8x15⅜ in. and total length of gibs is 11¾ in. Press is made in plain open belt with 125 spm and back-geared with 70 spm. Motor recommended is 1½ hp.

Diamond Machine Tool Co, 3429 E Olympic Blvd, Los Angeles 23, Calif

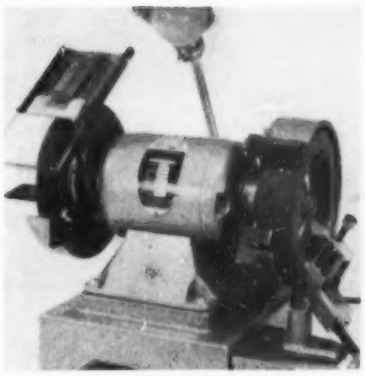
Hand-Operated Spring Coiler Makes Small Production Lots

Hand-operated spring coiling machine has been designed for making prototypes and small production runs up to 1000 compression, extension, and torsion springs. Aluminum castings and ball bearing carriage have been incorporated to increase accuracy and simplify operation.

Compression springs can be coiled to any desired pitch, with coils at both ends squared automatically. Extension springs can be wound with or without initial tension; torsion springs can be wound either left or right hand, with long, extended arms on both ends.

As many as 250 to 400 compression, or 200 to 300 extension or torsion springs can be coiled per hour — all exactly alike. Wire diameters can vary from 0.004 to 0.065 in., and spring diameters from 1/32 to 1¼ in., with lengths up to 4½ in. Arbors, wire cutters, and extra coiling points are included. Shipping weight, 50 lb.

Carlson Co, 277 Broadway, New York 7, NY

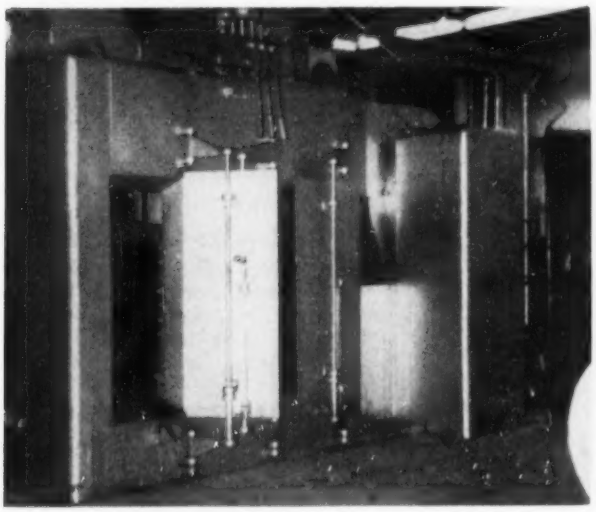


Tool and Drill Grinder Features Wide Range

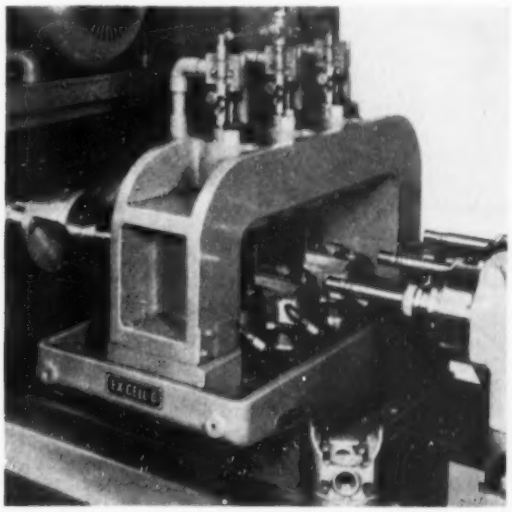
DoAll tool and drill grinder has twist-drill range from No. 60 wire size to ¾ in. Machine permits grinding of point angles from 45 to 75°, clearance angles from 6 to 15°, and chisel point angles from 117 to 135°. Average time to sharpen drill is said to be less than one minute.

It is reported that a new lip positioner makes it possible to grind small drills more accurately than on conventional machines. Drill-point gage is furnished so that operator can quickly check chisel-point clearance and point angle. Toolbit fixture is also furnished to permit grinding angles on small lathe tools.

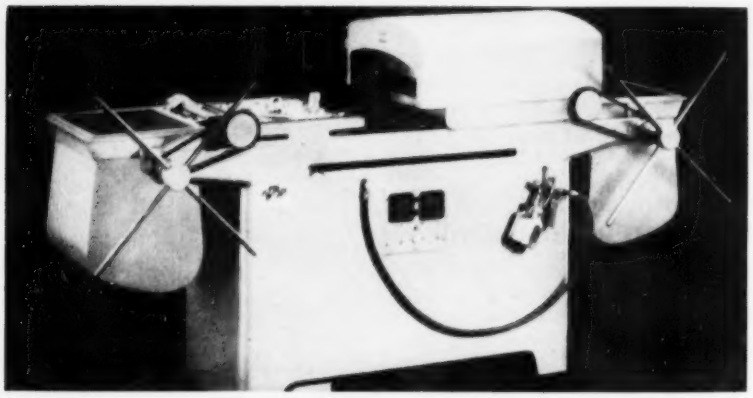
The DoAll Co, Des Plaines, Ill



TEMPERING AND FLATTENING FURNACE is a completely self-contained unit with three sections of pressure plates and three doors. Valves for opening and closing dies are above center door and cylinders are on top behind flat plates. When cylinders are raised, dies open to provide ten openings for insertion of flat pieces. Burner and control valve are in back of furnace. Control panel with all electrical switches is at right; hydraulic pumping system is behind this panel—*Waltz Furnace Co, 1901 Symmes St, Dept 1, Cincinnati, Ohio*



PRECISION BORING MACHINE (Ex-Cell-O) machining aluminum alloy pistons at net production of 221 pieces per hr. Three pistons are grooved, semi-finish bored, and finish-bored during each cycle. Equipment includes pushbutton controls, hydraulically operated fixture, and three spindles at each end. Spindles on left carry heads that feed and retract grooving tools. Those on right end carry finishing and boring tools—*Ex-Cell-O Corp, 1200 Oakman Blvd, Detroit 6, Mich*



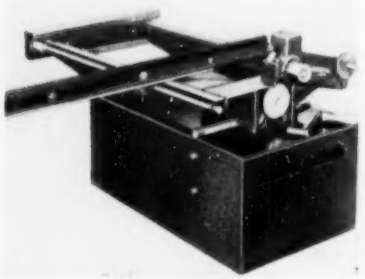
Shell-Molding Machine Produces Two Parts Per Min

Shalco Model HO-4 shell-molding machine features dual dump boxes and choice of gas or electric curing oven. Unit is available with automatic timers for both inversion and curing cycles. It is claimed that castings can be obtained with tolerances as close as 0.005 in. per in.

Use of ball-bearing-mounted hinged pattern insures positive alignment for precise shell duplication. Dump box design is said to facilitate even sand fall to increase uniformity of shells. Automatic dump box clamps, counter-balanced pattern frame and dump boxes, sealed ball bearings, positive air-actuated shell ejection, thermostatically controlled pattern temperature, and heat-resistant, permanently-bonded, silicone dump-box seals are standard features.

Single capstan swings pattern to locked position over dump box, inverts assembly and returns pattern to position. Curing oven rolls over one pattern and mold while the operator strips mold from other pattern and handles inversion cycle.

Shalco Engineering Corp, 81 Encina Ave, Palo Alto, Calif



Portable Power Unit for Lockformer Slitting Attachments

Compact and portable attachment will power both the 20-22 and the 24 Lockformer slitting attachments. Unit eliminates need for periodic mounting and dismounting of slitter from chassis. Attachment does not interfere with Lockformer operation but must be removed from chassis if power-flanging attachment is to be used.

The unit incorporates a ¼-hp. ball-bearing capacitor-type motor, bronze reduction-type worm gear and heat-treated drive gears. Gear-drive unit operates in sealed oil bath. Price is less than $100.

The Lockformer Co, 4615 West Roosevelt Rd, Chicago 50, Ill

Water Recirculation Pump

Industrial pump with scoop rotor and rubber roller-type vanes was designed for production in bronze to meet continuous water recirculation requirements. Model 4300 is engineered for continuous-duty service through the use of sealed, permanently lubricated ball bearings. Additional feature is pressed fit of stainless steel shaft into inner ball bearing race to restrict lateral movement of rotor.

A continuous 5,000 hour test with water at 40-lb pressure reportedly produced no measurable wear in the rubber rollers or the pump case. Pump impeller is self-lubricated by water and will deliver approximately 7 gpm at 50 lb pressure and 1750 rpm. Pressure range is from 0 to 75 psi; pump is furnished with ¾-in. ports. Weight is 4½ lb.

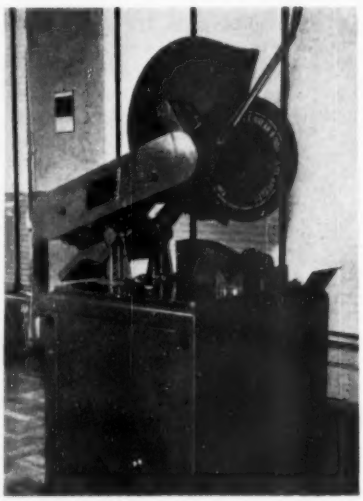
Hypro Engineering, Inc, Dept KP, 40½ Washington Ave, Minneapolis, Minn

Metal Cutting Fluid for Tapping Operations

Tapeze, dynatomic metal-cutting fluid, is said to give the same low-rupture energy advantages to tapping and threading as that provided by the Metalloid X-60 series cutting fluids used for production machining. This means that less force is required to produce threads, making it easier while reducing tap breakage. Tapeze will tap stainless steel titanium and other types of steel. It may be applied straight by hand using a pressure-type oil can or paint brush.

Fluid is an organic condensate containing chlorine, oxygen, nitrogen, and a trace of sulphur, capable of releasing nascent atoms at low temperatures. It is available in pints, gallons and five-gallon sizes.

The Metalloid Corp, 514 North Jefferson, Huntington, Ind



Metal-Cuting Saw For Difficult Parts

Mercury saw will do multiple cutting of aluminum, dural, copper, monel, stainless, tool steel, cast iron, and duroline. It is reported that 4-in. cast-iron pipe can be cut in 5 sec.

Unit has quick-acting foot-controlled chain vise to hold material. Welded steel protective hood completely shields the wheel. Ventilating duct keeps dust at a minimum. Smooth transmission of power is assured by multiple V-belt drive between statically balanced pulleys.

Saw is equipped with 5-hp, 3-phase, 60-cycle, 220/440-volt motor with manual pushbutton control. The unit is 60 in. high, 30 in. wide, and 48 in. long.

W. F. Obear & Son, 6075 South Normandie Ave, Los Angeles 44, Calif

LEADING EQUIPMENT MANUFACTURERS

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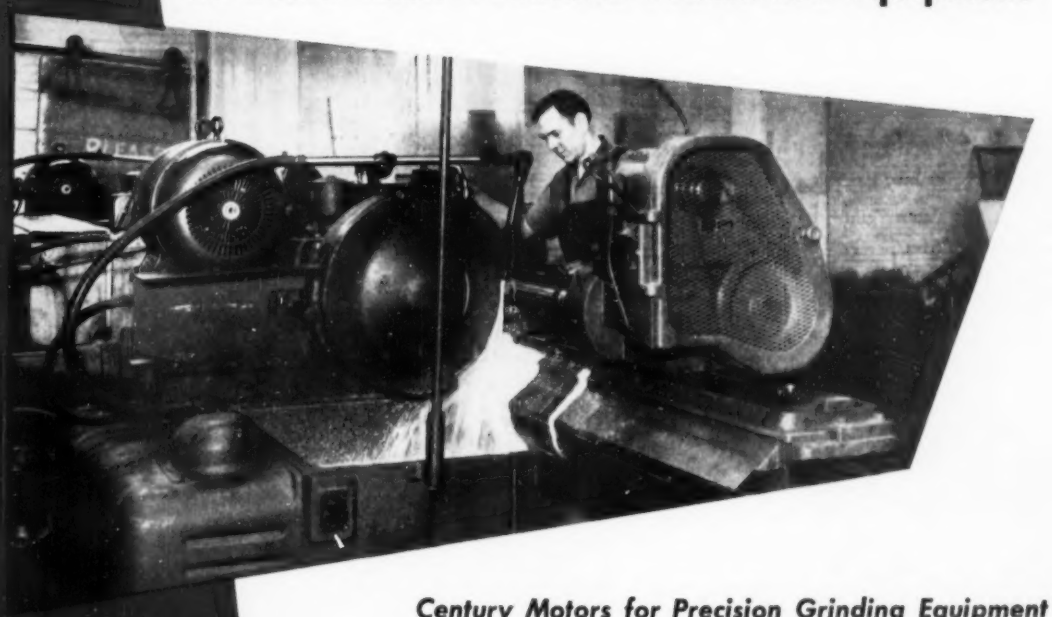
to Drive Their Precision Production Equipment



Century Motors for Precision Grinding Equipment

- Century Motors are unusually free from vibration—the business end of the grinder is not handicapped.
- Century Totally Enclosed Fan Cooled Motor, protects vital parts of the motor from gritty oil fumes in the surounding atmosphere.
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- Ball bearing enclosures seal the lubricant "in" and the dirt "out." Lubricated at the factory for several years' normal operation. Provided with plugs for relubrication when required.
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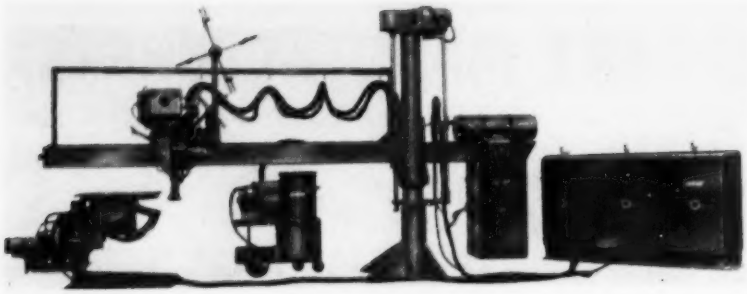
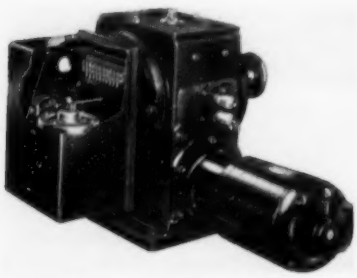


Automatic Welding Machine Uses Motorized Pedestal

Leader Model 700 automatic welding machine has heavy-duty head with 1200-amp dc current source which can be used individually as three 400-amp manual welders. It has two control panels: operator's control panel located on horizontal cross bar plus main control panel. Pedestal is motorized and has 96-in. travel; rotates to 360 deg and has built-in locking and limit switch controls.

The 132-in. cross-arm has acme-actuated, variable-speed reversible-drive motor for carriage traverse with built-in limit controls. Other features include: manual and automatic bead-lapping control, rapid-traverse control, free-wheeling clutch, lead adjustment and angling device, 500-lb capacity dual flux bins, standard P3000 positioner, standard vacuum flux-recovery system, and dual, adjustable spring-braked reel holders holding 250 lb.

Leader Welding and Mfg Co, 2418 Sixth St, Berkeley 2, Calif



Air-Weight Control For Tubular Blowers

Dyna-Jet, originally designed for constant air-weight control with motor-driven cupola blowers, has applications to control of mixers, grinders or polishers. Regulator is equipped with special power-responsive signal system; constant air-weight control is based on the principle that air-weight delivered by motor-driven blower is directly proportional to power consumed by driving motor. Unit measures three-phase power; puts out a high-level hydraulic signal in proportion to the deviation from a preset power level. This hydraulic force, acting on a two-way hydraulic cylinder positions the blast gate.

Two models are available. Unit Dyna-Jet has built in oil supply and pump, suited for installations requiring moderate control-power needs. Standard Dyna-Jet for greater hydraulic output uses separate pump and oil supply.

Cost is said to be low because there is no need of change or addition to existing piping. Adjustments are made with a handwheel scale calibrated directly in units of air-weight delivery. The system is self-lubricating.

Dyna-Jet is used with conventional instrument transformers with 120-volt and 5-amp secondaries; motor potentials up to 2400 and currents up to 800 amp can be used when suitable voltage and current transformers are selected.

Askania Regulator Co, 240 East Ontario St, Chicago 11, Ill

Hydraulic angular bolt cutter has been added to the Guillotine line, designed for flush trimming bolts to the nut, or for other metal trimming jobs needing a close cut. Unit has a $^{7}/_{8}$-in. mild steel bolt-trimming capacity. It can be obtained with cut-back jaws for use in splitting nuts during wrecking operations, or for trimming wire mesh. Power is supplied through a portable hydraulic pump. Manual lever eliminates need for solenoid switches; cuttting head weight is 23 lb.

Manco Mfg Co, Bradley, Ill

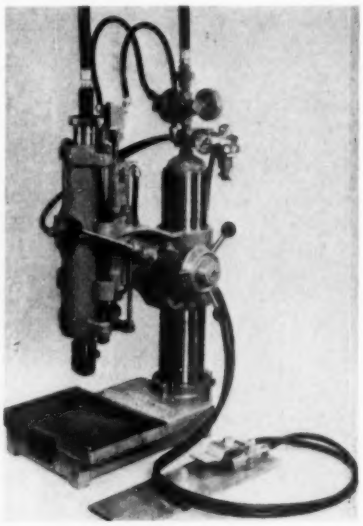
Punch and Die Designed For Hand Nibbler

Hand nibbler, with built-in punch and die, cuts up to 14-gage steel without distortion to either side of the material. Since pressure is applied only to material being cut, holes in tubes and ducts can be cut without damaging original contour.

Each stroke of the punch removes a slug of metal; part can be fed in the length of removed metal. This requires no pressure on the work to feed against cutting action, as design alternates cutting and feeding portions of the cycle.

Single adjustment for different gage materials permits quick change-over from one job to another. Unit can be used as a hand instrument or clamped in a vise for use as a production tool.

Fenway Machine Sales Co, 263 N 23rd St, Philadelphia 3, Pa



Pneumatic Impact Press Provides Uniform Force

All-pneumatic impact press will deliver any force from 30 to 30,000 lb. Features are said to be complete uniformity of impact force on work varying in thickness, operator safety, and speed up to 10,000 complete cycles per hour. On work of uniform thickness, clearance may be as little as 0.005 in.

Operation is achieved by variable-stroke air hammer moving within close cylinder, striking chuck projecting through bottom of cylinder. Length of hammer stroke is adjusted by large hand nut at top. Air flow occurs only during operating cycle.

Heidrich-Nourse Co, 631 East Third St, Los Angeles 13, Calif

IT WILL PAY YOU TO LOOK INTO REVERE'S 70-30 BRASS TUBE— *it paid SCHAIBLE!*

Model #922—Schaible Faucet Assembly with Hydramold Spout. To date more than 1,000,000 Hydramold Spouts have been produced, and not one single failure reported from the field.

Close-up of Schaible Hydramold Machine (Patents Pending): Operation of this machine requires no special skill of the operator. One or any number of workpieces respond to accuracies of a thousandth part of an inch. Wall thickness of spout is uniform, nonporous, without inclusions, seams or joints.

A brass that does not have to be "tailored" to a job, but is made with accuracy in normal mill procedures, meets the unusual material requirements that the Schaible Company has in its remarkable spout fluid forming process called Hydramold.

The Schaible Company, Cincinnati, Ohio, is one of the larger manufacturers of strainers, valves and faucets, who have been more progressive in product design and methods of manufacture. Schaible requirements are exacting as to product quality control. This is especially true of sources of material, and when the company developed, designed and built its four new Hydramold machines to manufacture modern spouts from tubular material, the specifications became most rigid.

This was where the Revere Technical Advisory Staff entered the picture. Revere technical men studied the Hydramold process developed by Schaible engineers, and the unusual forming requirements, thereby helping establish the exacting specifications so that the mill and manufacturer developed mutual material control and process information.

The Schaible Company has made more than one million spouts by this new method without a single field performance failure—better spouts, states Schaible, produced by more economical means than conventional casting methods.

Today, there may be more costly spouts, but according to Schaible "There is no better spout than the Schaible Hydramold formed spout."

This case study is another example of the value of close cooperation between Revere and an exacting customer. The more we know about what you make, and how you make it, the better we can serve you. See the nearest Sales Office.

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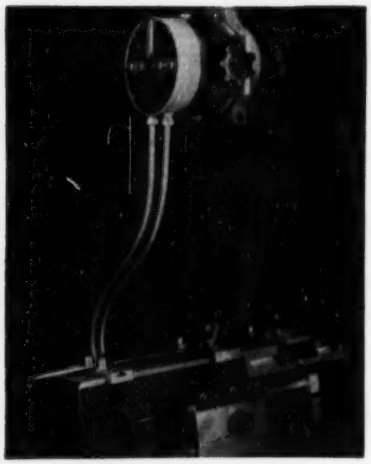


Jaco Hydraulic Feed For Punch Presses

Automatic coil and strip stock feed is said to have design features which permit its use over a wide range of punch press applications. Device used is positive displacement pump with handwheel control for varying volume of oil displaced, permitting immediate and infinite adjustment of desired feed length within limits of tool from zero to maximum. Provision is made to permit timing stock movement to start or end at any point in ram stroke.

Slide table is equipped with open-side gripper boxes which can be used to push or pull the material through the dies. Adjustments are provided to raise or lower the feed table within a range of 4 in. to maintain the strip centerline level with each tool.

Model A handles material up to 6 in. wide with 6-in. maximum feed stroke and 3/32-in. thickness; capacity of Model B is 12 in. wide with 12-in. maximum feed stroke and 3/32-in. thickness.

Unit is designed and manufactured by Birmingham Tool Co of England.

Imported by JACO Devices, Inc, Hingham, Mass

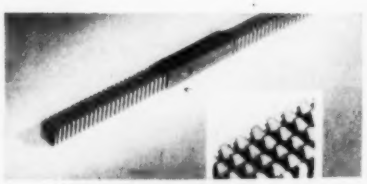
HOLTITE-Nylok one-piece self-locking screws and bolts have a nylon insert which conforms to the curvature of the screw threads and provides positive locking action when stopped. Screw's reusability is said to be unlimited because of smoothness and ease of locking. Depth of hole for nylon plug has been reduced so that screw is not weakened. Tensile tests show greater strength than for plain screws of same size and material.

Continental Screw Co, New Bedford, Mass

Small Parts Cabinets

Akro-Mils line of small parts cabinets makes available wide variety of sizes and models. Single units provide from 8 to 384 separate compartments with a maximum of three compartments per drawer. Storage cabinets are made in 24 different stock models: ten models have 8 to 128 plastic drawers and range in price from $4.25 to $55.95; ten models are available in a combination of plastic and steel drawers priced from $12.95 to $57.75; four models of lightweight carrying cabinets are priced from $7.95 to $15.95. Plastic drawers are 5⅞ in. long, 1 7/16 in. deep, 2¾ in. wide; steel drawers are two, four or eight times the capacity of the plastic drawers.

Akro-Mills, Inc, Box 989, Akron 9, Ohio

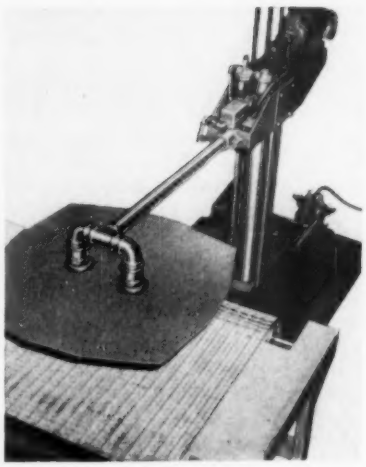


Thread Restoring Tool Eliminates Use of Die

Thread restoring tool for damaged external threads eliminates shaping with three-cornered file or use of die. Used like file, few passes across damaged threads remove burrs and deformed metal.

Restorer is made of hardened steel 2½ in. long and 7/16 in. square. Available for either National Coarse or National Fine threads.

Reiff & Nestor Co, Lykens, Pa.



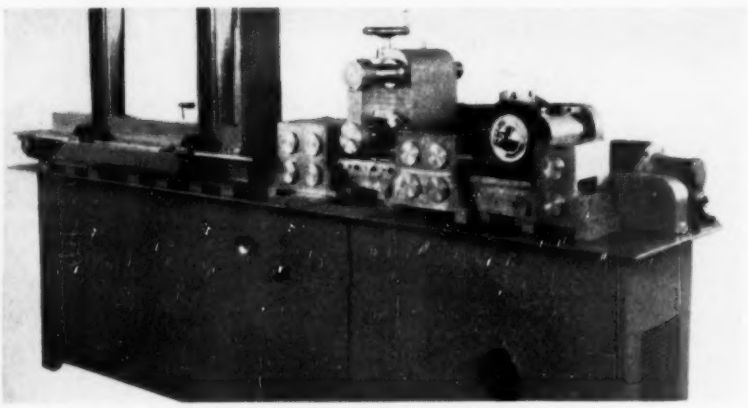
Automatic Vacuum Lift Handles Metal Sheets

Union automatic vacuum lift, containing its own vacuum plant, handles any nonporous metal sheets up to 40x40 in. at the rate of one to six sheets per minute.

Unit will pick up at any level from floor to 36-in. height, and is adjustable through this range; it is also adjustable through 180° turn so that sheets can be positioned exactly in repetitive operation. Air consumption per cycle is approximately 60 cu ft. Pushbutton control can be located on separate unit convenient to the operator; automatic cycle can also be provided.

The 1800-lb machine is shipped completely assembled, ready to hook into electric power and airline. Floor area required is 36x48 in. for base, with arm extending out about 4 ft; height is 6 ft.

Union Tool Corp, Warsaw, Ind



AUTOMATIC HOPPER-FED GROOVING MACHINE has been developed to form mill, slit, or groove strips of plastics, wood, aluminum, fiber, or graphite from ¼ to 3½ in. wide in thicknesses from 1/16 to ¾ in. and in lengths from 18 to 48 in. Milling arbor is powered by 5-hp ball-bearing motor. Rate of feed can be regulated — *Central Machine Products Corp, 228 Pennsylvania Ave, Paterson, NJ*

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Illinois Gear, the World's largest, most modern, best equipped gear manufacturing plants, offers you the coordinated, synchronized action that makes a champion. It results from broad experience, second-to-none facilities and above all the will to produce!

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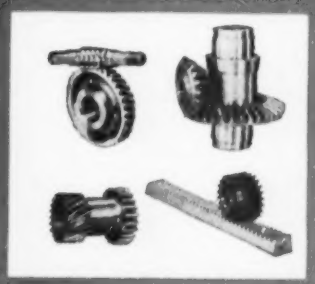

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Visual Gage Accessory Classifies Ball Bearings

Sheffield Corp has developed a visual gage accessory for quickly and accurately segregating ball bearings into any one of ten dimensional classifications after gaging. A ten-place classification tray being used with a visual gage of 10,000X is illustrated; tray may be used, however, with other magnifications and adapted for any number of ball sizes.

Balls are gravity-fed from the V trough into a receiving hole in a slide. Moving the slide to the right carries ball into position beneath gaging spindle where it rests on a carbide surface. Operator takes the reading and moves the tray until proper size compartment is under ejection chute; then ball is released, permitting it to roll down chute into tray. Ball sizes can be classified in increments of 0.000010 in.

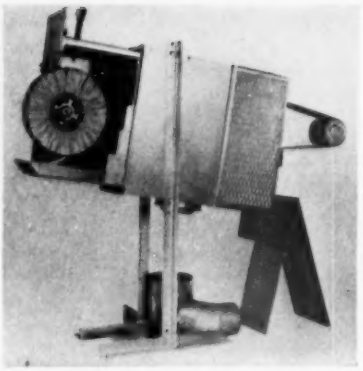
Sheffield Corp, Dayton 1, Ohio

Spade Drill Holders Available For Large Screw Machine Use

Series of spade drill holders is available for use on large automatic screw and chucking machines. Straight-shank tools are designed with a short overall length; cutting-dia sizes range from 1¼ to 3½ in. They are drilled for coolant; two threaded coupling holes allow a choice of coolant coupling connections.

Holders use blades now supplied for deep-hole drilling operations or can take special blades that combine drilling with facing, chamfering, or counterboring operations. Units to take diameters smaller than 1¼ or larger than 3½ in. are manufactured as special tools.

Waukesha Tool Co, Waukesha, Wis

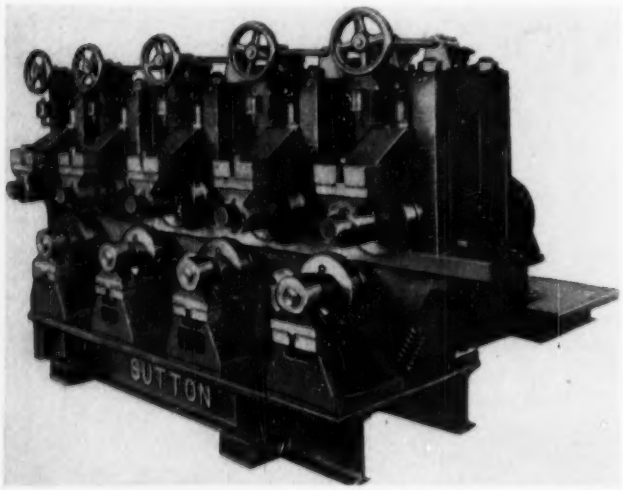


Self-Filtering Hood Buffs and Polishes Wheels

Elim-O-Dust uses the wind created by the revolving buffing or polishing wheel or belt to withdraw dust down to 0.02 microns in size. Snagged parts are deflected by the air foils. Filters used facilitate the reclamation of valuable metal.

Universal hood can be adjusted to any height spindle and to any angle. It is designed to accommodate straight-back or floor-level-back stands for polishing belts. Will accommodate wheels up to 18 in. in diameter and 9 in. wide. Total cost with basic hood, belt feature, and filter is $150.

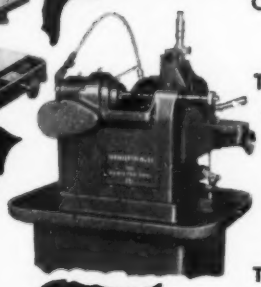
Slonneger Products Co, 1524 Milburn Ave, Dayton 4, Ohio

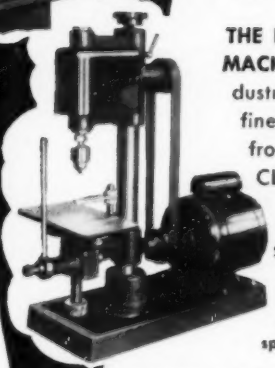


STRAIGHTENING MACHINE handles angle, channel, and T-section shapes, as well as squares and flats. Rated capacity is: squares from ½ to 2½ in.; flats from ½ x ¾; hexagons from ½ to 2½; angles from 1¼ x 1¼ x ¼ to 4 x 4 x 3¾; and channels from 1½ to 4 in. Any steel or non-ferrous flats can be straightened, including alloy and tool steel. Pass line consists of four bottom-driven rollers with five top-pressure or deflecting idler rolls. Pressure adjustments are controlled by handwheels at the top. Top roll housings are adjusted longitudinally on the base. Top rolls have in-and-out adjustment along centerline of roll shaft— *Sutton Engineering Co, Bellefonte, Pa*

DYNAMIC BALANCING MACHINES feature dual pick-up controls (automatic or manual), dual number drum openings for either vertical or horizontal correction, and redesigned flexing head and roller assemblies. Model 353-R has shaft-dia range from ½ to 5 in., weight capacity of 10 to 600 lb, 40-in. swing dia capacity, and extra bed-length in sections of bolt-on type. Model 345-R has 30-in. swing, Model 375-R-HD shaft-dia capacity 1 to 8 in. — *Bear Mfg Co, Rock Island, Ill*

Hamilton PRECISION DRILLING MACHINES • TAPPING MACHINES GEAR HOBBERS





If your work can be done within the framework of the specifications of these machines you can not buy a more precise tool than one bearing the Hamilton nameplate.

THE HAMILTON VARIMATIC® SUPER SENSITIVE DRILLING MACHINE is designed for the accurate production-drilling of small holes in all drillable materials. Its capacity ranges from .004" to .3125" and its spindle speeds, which range from 840 to 9300 R.P.M., are infinitely variable.

CLEARANCES Center of chuck to column..... 5"
Round table to chuck.....10"

THE HAMILTON NO. 00 PRECISION GEAR HOBBER is a machine of extra precision and extra rigidity. It is used for the generation of spur gears and pinions to 2" outside diameter of the workpiece. Alignment and trueness of the work spindle and hob spindle is held to within .0002". Accumulative error is regularly held to .0002" or less.

THE HAMILTON NO. 1 PRECISION GEAR HOBBER generates spur and spiral gears, worms and worm gears, splined shafts, gear sectors and pinions of extra accuracy and at high production speeds. The alignment and trueness of the work spindle and hob spindle is held to within .0002". Accumulative error is regularly held to .0002" or less. Maximum workpiece diameter is 6".

THE HAMILTON SUPER SENSITIVE, SMALL HOLE TAPPING MACHINE is designed and built to serve the precision industries. Its tapping capacity is from the smallest and finest tap to 10/32 inclusive. Its spindle speeds range from 1200 to 2600 R.P.M.

CLEARANCES Center of chuck to column....3¼"
Round table to chuck.....4"

Selection of a Hamilton tool, even though your present work does not require Hamilton accuracy, is a wise and far-sighted decision, for Hamilton's production potential and "reserve of accuracy" permits you to face possible specification changes with complete confidence.

Prepare now to meet restless competition in the months ahead. Equip your plant for precision production and be confident that your competition can not deliver more.

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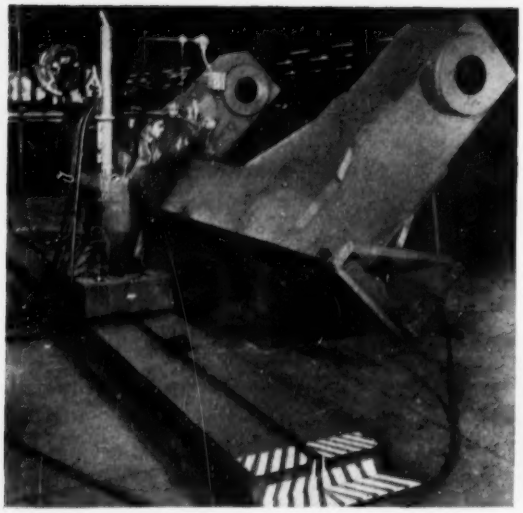
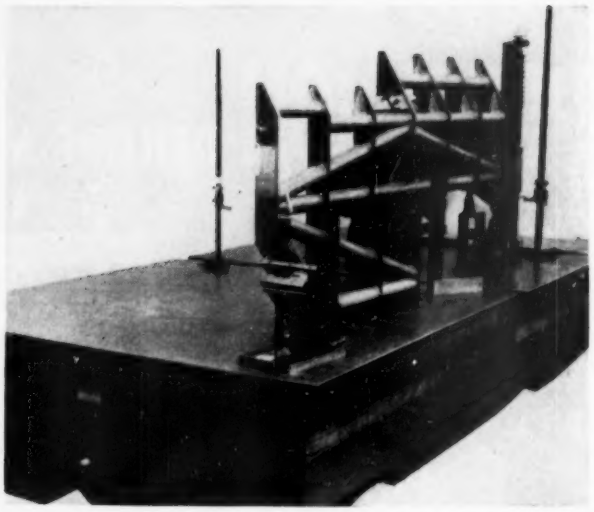
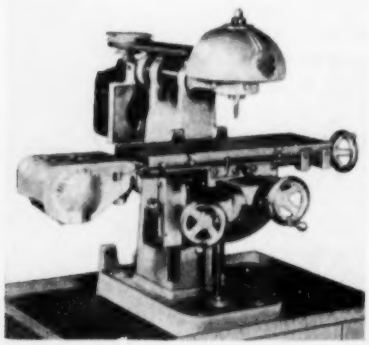


AUTOMATIC WELDING MACHINE developed to improve quality of welds on large structural parts at National Supply. It is a fully automatic submerged melt machine incorporating welding head from older type machine. Head position is adjustable vertically and laterally on carriage. Two 600-amp welding generators supply current to welding wire 3/32 to ¼-in. in dia. Flux is fed by compressed air—*The National Supply Co, Torrance, Calif*



MULTIPLE-UNIT SURFACE PLATE consists of two or more granite surface plates on a single stand which provides a means of aligning the plates. Advantages claimed are: makes possible larger surface plates than have ever before been built; fabrication, shipping, and handling are economical and easy; there is more clamping space because spaces between plates are effective and convenient T-slots; the plates can be used alone. Each plate is adjustably supported at three points—*The Elkro Co, 736 Albany St, Dayton 8, Ohio*



Power Feed Accessory For Benchmaster Mills

Accessory power feed for use on all Benchmaster handscrew mills is designed to mount on end of table, making it adaptable to all Benchmasters, regardless of age.

Worm and gear unit is driven by a small, independent electric motor operating on 115-v ac, permitting table operation totally independent of spindle speed. Power developed exceeds milling capacity of the machine. Four table speeds are available: 1.2, 2.1, 3.2, and 4.5 in. per minute. Travel is reversible, permitting milling in either direction. Automatic stops are adjustable for any desired length of stroke. Manual operation is unaffected through incorporation of a disengage lever. Installation is simplified by slots in the adapter plate, allowing easy alignment of drive shaft with table leadscrew. Unit is not adaptable to production mills with rack and pinion feed.

The 10-lb accessory is 4½x5½x8 in. Price, $125.

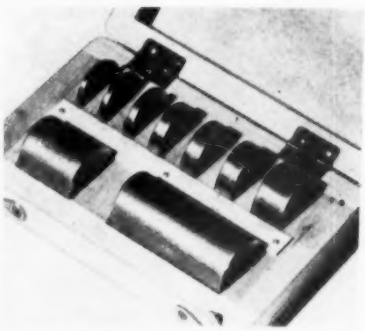
Benchmaster Manufacturing Co, 1835 W Rosecrans Ave, Gardena, Calif

Solvent Spray Gun Operates Directly from 55-gal. Drum

Model B-202-M siphon spray gun for continuous spray cleaning by solvent, emulsion, or aqueous solution, is designed to draw fluid directly from a 55-gal. drum, eliminating time wasted in refilling small supply cans.

Unit is equipped with a die-cast handle, built to stand over 4 tons of shock, airflow control valve on the shaft to eliminate trips to the air-supply regulator valve, ball-check to prevent fluid flow-back, and adjustable lock-tip nozzle. Price, $19.95.

John B Moore Corp, Nutley 10, NJ



Circular Gage Blocks

Standard 9-piece set of Swedish circular gage blocks makes up into 331 combinations of 50-millionth accuracy.

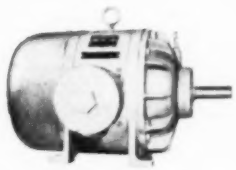
They are said to afford a considerably increased gaging surface due to circular construction and 1-in. dia; when stacked for vertical dimensions, blocks present a rigid, well-balanced gage which adequately resists any normal amount of side pressure. When rung together they form a rigid round bar which can easily be handled either in a vertical or horizontal position, and used in many other ways which would be impossible with normally shaped blocks.

Transocean Trading Co, 6453 Santa Monica Blvd, Dept AM, Los Angeles 38, Calif

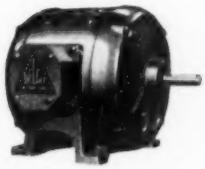
DEPENDABILITY...

that minimizes costs

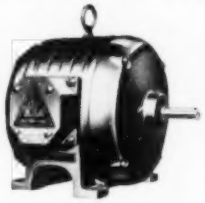
Delco Motors



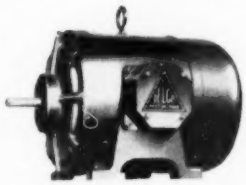
Explosion-proof motor



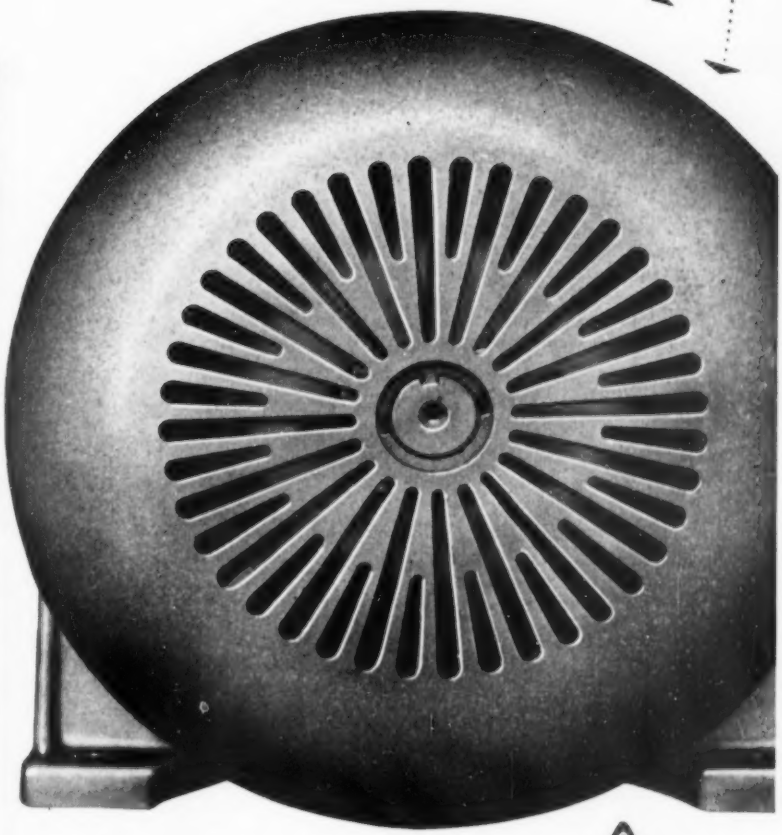
Open ball-bearing motor



Totally enclosed ball-bearing motor



Totally enclosed fan-cooled motor



With Delco integral motors on your machines you have a cost factor on which you can depend.

For Delco designs and builds with one idea in mind—to produce motors that will run dependably, under extreme conditions, for record-breaking periods of time.

Put your trust—and your motor dollars—in Delco motors . . . your nearest Delco sales office will help you with all details.

DELCO DAYTON OHIO

DELCO PRODUCTS

Division of General Motors Corporation
Dayton, Ohio

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Heavy-Duty Cleaning Unit Processes Cold Parts

Large, cold-parts cleaning unit, designated Model H-95, for flushing, spraying, or soaking metal parts, dies, large bearings, and assemblies has been added to the Graymills line of metal-cleaning equipment.

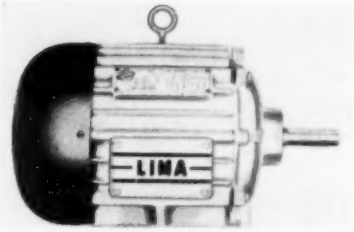
Abrasive-proof pump delivers a gusher flow of solvent through heavy, flexible metal hose. By turning a selector valve, flow can also be directed through another flexible hose with handgrip valve for quick on-and-off action. Pump is also used to circulate fluid in the tank by jet action to speed cleaning of parts to be soaked or immersed.

Three-level shelf supports parts at convenient height; immersed parts rest on a removable rack. Minimum capacity, 100 gal., maximum, 175 gal. Unit is 5 ft long, 3 ft wide, 3 ft 2 in. high.

Graymills Corp, 3705 N Lincoln Ave, Chicago 13, Ill

Two lubricants have been introduced for high speed machining of stainless, molybdenum and other high alloy steels, as well as carbon steels. According to tests, Vantrol 5495-A replaced other oils on an AMS 6415 molybdenum with average R_c 32 and at same feed and speed, increased tool life from 15-30 pieces to 300 pieces, or eight hours of operation without tool change. On AMS 5640 stainless, tool changes of 3-4 times per shift were reduced to 1-2, with a 50% increase in finish and reduction of downtime of 60%.

Van Straaten Chemical Co, 546 W Washington Blvd, Chicago, Ill

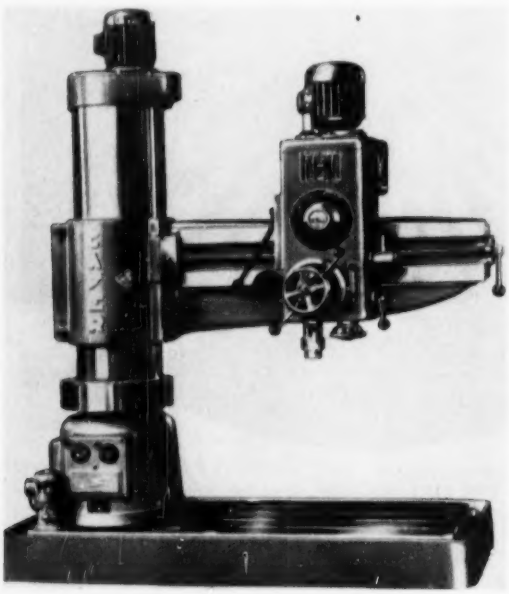


Lima Industrial Motors From ¾ to 20 hp

Lima Type E motors are available in ratings of ¾ hp at 900 rpm to 20 hp 3600 rpm in NEMA frame sizes 224 to 326. Motors can be supplied for vertical-, wall- or ceiling-mounting as well as standard horizontal floor-mounting. They are two- or three-phase with all standard frequencies and commercial voltages below 600 volts. One year guarantee is issued with each motor.

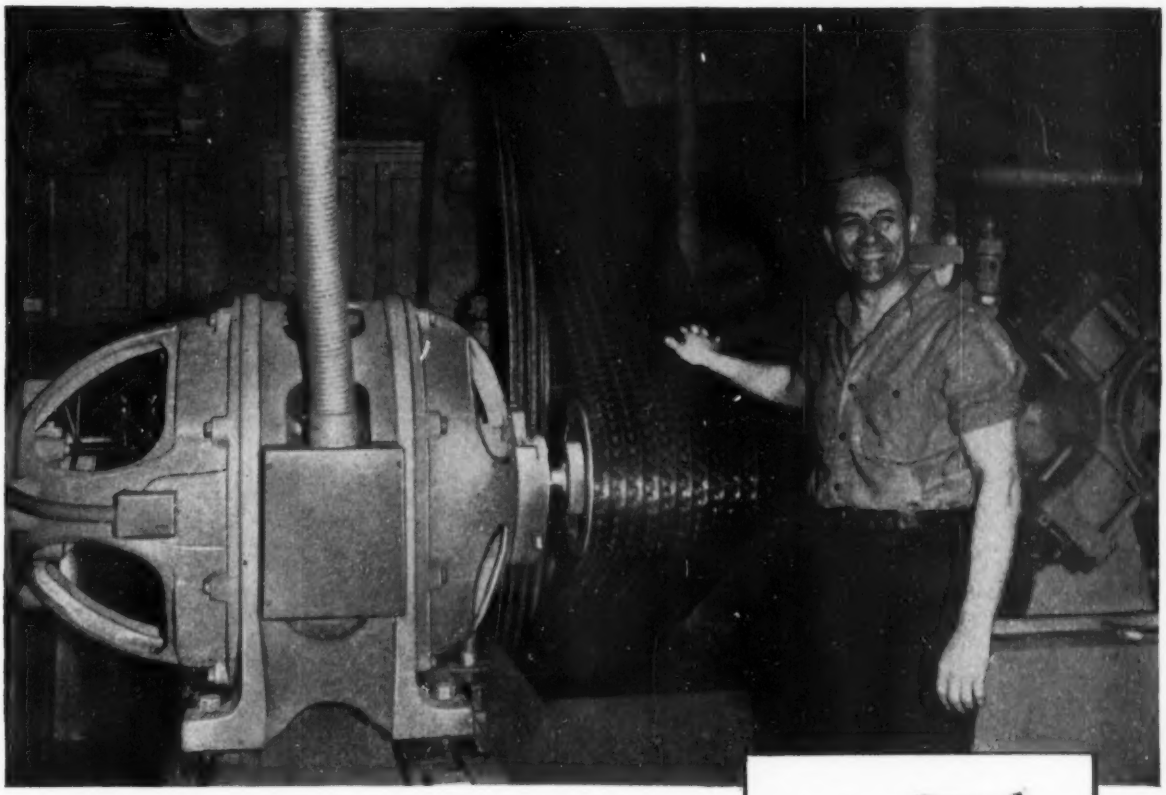
Features include integrally cast fins providing extra heat dissipating surface, double-width prelubricated sealed ball bearings, special cast-aluminum fan to provide high velocity air, and cast-iron frames with integral feet.

Lima Electric Motor Co, Dept 103, Lima, Ohio



RADIAL DRILLS (Caser) have pre-selector speed-change lever which eliminates necessity of passing through intermediate speed changes when changing from drilling to boring operations. All controls are centralized at low position on head. Drilling, boring, tapping, facing, and reaming operations on materials from cast iron to aluminum are said to be within easy range of machine. Incorporates safety devices for overload, vertical arm movement, and arm travel—*Imported by S&S Machinery Co, 140 53rd St, Brooklyn 32, NY*

MECHANICAL PRESSES from 160 tons up form new Wickliffe line of machines for forming, blanking, piercing, trimming, light-embossing, and drawing. Frames are straight-sided; all members are box-type. Slide adjustment is of barrel-type. Air-operated clutch and brake feature: low unit working pressure on facings; low inertia of clutch and brake disks; hollow-center ventilating disks; and design for fast heat dissipation. Full control of press is obtained by pushbuttons. Complete line of two- and four-point single-action presses has been developed—*The Cleveland Crane & Engineering Co, Wickliffe, Ohio*



with Veelos on your machines...

v-belt replacement takes up to 90% less time

Actual in-plant records prove that Veelos v-belt can be installed *and operating* in up to 1/10th the time regularly needed to do the same job using endless v-belts.

Matched sets of Veelos are quickly made up in your own stockroom or at the machine by just coupling the correct lengths for the particular drive. Even outboard bearing drives are no problem. You *never* remove these outboard bearings, because Veelos is installed by simply coupling it around the shafts and running it onto the sheaves. And maintaining adequate stocks of Veelos is practically automatic. A quick check of the Veelos 100-foot reel will tell the inventory story.

For full vibrationless power delivery, for fast adjustability to keep sets matched, for ease of controlling inventory and for quick, simplified replacement — standardize on Veelos.

Have you seen this Veelos Facts Book?

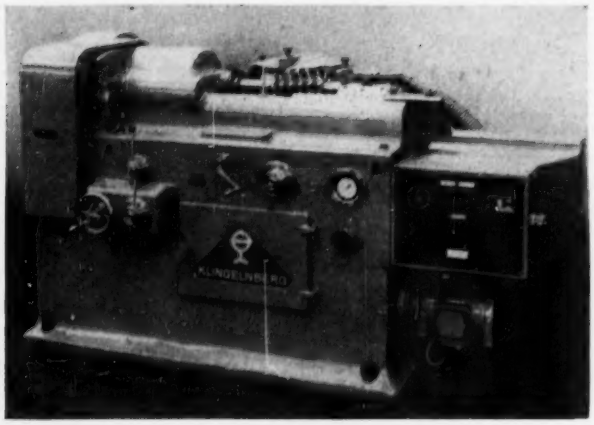
Your Veelos v-belt distributor's salesman will be glad to give you a quick trip through this fact-packed, 36 page book. You'll find it well worth the few minutes it takes. Next time the salesman calls, ask him to show it to you.

VEELOS
THE LINK
V-BELT

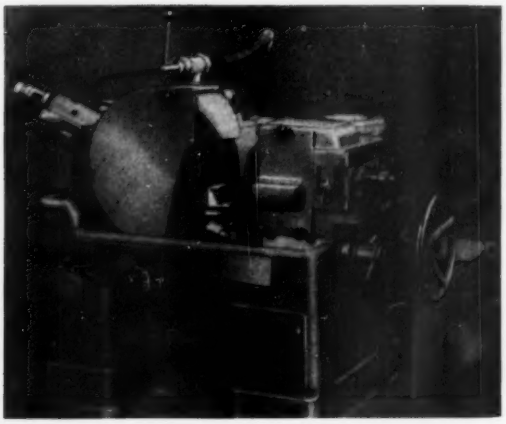
Write for a copy of the VEELOS DATA BOOK. It's fully illustrated and packed with useful engineering data. We'll be glad to send a copy along and you'll be glad to have it!

MANHEIM MANUFACTURING AND BELTING COMPANY
601 Manheim St., Manheim, Pa.

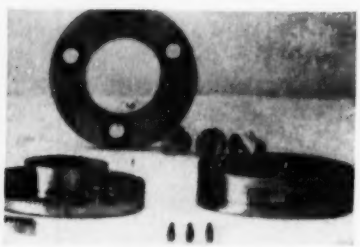
ADJUSTABLE TO ANY LENGTH • ADAPTABLE TO ANY DRIVE



TOOL AND CUTTER GRINDER sharpens gear-cutting hobs with stationary hob table and reciprocating grinding wheel. Machine is hydraulically controlled and automatic in operation; accuracy of indexing is reported to be within 0.0001 in. Spiral lead is set by change gears; both reciprocation of wheel and rotation of hob are controlled by single threaded spindle. The index plate is mounted on same spindle as hob. Hand lever allows machine to be changed over for straight or spiral flutes. Max wheel slide stroke is 20 in.; max dia of work is 12 in.; lead range is from 15 to 750 in. on spiral flutes. Machine will grind a max length of 16 in. with max depth cut of 3⅜ in. Model GW 30, manufactured by Klingelnberg—*Imported by Kurt Orban Co, Inc, 205 E 42nd St, NY 17, NY*



CENTERLESS GRINDING MACHINE (B S A Tools Ltd) features swiveling control head, grinding wheel spindle with micrometer lateral adjustment, separate truing slides for control and grinding wheel, power truing of wheel, form-grinding facilities incorporated in standard machine, independent drives for control and grinding wheel, grinding head slideways automatically lubricated, and max accessibility to all units. Work from 1/16 to 3 in. in dia can be ground by straight-through or plunge-cut methods. Attachments enable through-feed bar grinding from 1/16 to ¾ in. in max lengths of 10 ft.—*Imported by Carney Stansfield Co, 270 E Hamilton St, Allentown, Pa*



Steel Roller Stamp Features Locking Device

Ramshead Roliner is adaptable for use in regular marking machines, ordinary screw machines, or lathes. The stamp is precision made and allows user to select the information to be marked by means of interchangeable tapered-type inserts supplied with holder. A retaining ring fits over the type inserts and holds them in place. Blank segment inserted at end of line of type has an elongated hole to compensate for lines of varying lengths.

Special locking feature, Ramlock, is said to effectively prevent the type slippage that often results from repeated roller marking. One side of the blank compensator segment is toothed to engage matching toothed section in the base of roller die. After type inserts have been set in place and retainer ring set over them, the toothed sections interlock, making further type movement impossible.

Type inserts are of tough alloy tool steel, heat-treated and scientifically beveled to give sharp impressions. They are available in standard-type styles and in sizes ranging from 1/32 to 5/32 in. by 64ths.

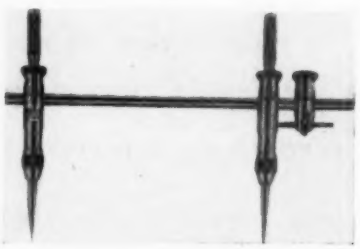
Acme Marking Equipment Co, 8030 Lyndon, Detroit 21, Mich

Extra-Long-Point Centers for External Honing Operations

Ready Tool has brought out an extra-long-point anti-friction center designed to provide perfect balance as well as accurate support under extreme loads and speeds in external honing operations. Work is held fast as head comes up close.

Center illustrated is over 2 ft long, but it can be made in any length, size, taper or straight shank; point and head sizes are determined by application requirements. Locked-in duplex angular contact-type bearings are self-lubricated. Labyrinth seal prevents entrance of dirt.

Ready Tool Co, 554 Iranistan Ave, Bridgeport 5, Conn



Steel Beam Trammels Designed For Easier Use, Versatility

No. 180 series of Lufkin steel beam trammels, designed for layout work, scribing, and measuring, has free-turning knurled grips on top of each tram for convenience in use. Top of rigid beam is flattened to prevent turning, once trams are set; spring friction eliminates sliding off beam when clamping nuts are loosened. Instrument has hardened scriber points and fine-thread adjusting screw.

With 20-in. extension beam, circles up to 72 in. in diameter can be scribed with the 20-in. trammel. Needle point, pen attachment, steel point and lead-holding chuck, and ball point attachments are available. Beams are furnished 10½, 14½, and 20 in. long and are priced from $9 to $10.40.

Lufkin Rule Co, Saginaw, Mich

NEW
Allen leader point cap screws
Dropping, knocking against metal surfaces and faulty line-up are major causes of damaged threads. Allen's new unthreaded leader point substantially reduces the causes of screw thread injury, or damage to threaded holes. Grip Heads, precision fit sockets that adhere to the key, *plus* the new leader points, make Allens the world's easiest starting cap screws, particularly in inaccessible spots. Sold *only* thru leading Industrial Distributors.
ALLEN HEAD
ALLEN
MANUFACTURING COMPANY
Hartford 2, Connecticut U.S.A.

NEW

Allenpoint Set Screws

WITH SCIENTIFICALLY-DESIGNED SMALLER CUP POINTS

Tested comparatively by United States Testing Company* with standard cup point screws and screws with angled and serrated points, the new Allenpoint demonstrated (1) greater locking power at *all* measured installation vs removal torque pressures, (2) uniformly high shaft holding power in torque resistance tests, (3) unmatched performance under vibration, and (4) more complete shaft contact pattern. Sold *only* by leading Industrial Distributors. Write us for more facts about the results of these important tests of set screw performance.

**Report No. E 5576, March 17, 1953.*

ALLEN

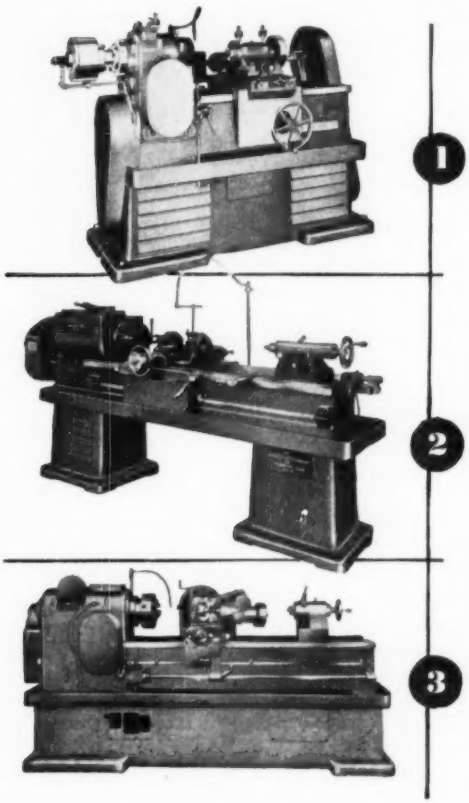
MANUFACTURING COMPANY

Hartford 2, Connecticut U.S.A.

ALLEN HEAD

If it has to be precision THREADED ...a COULTER will do it faster, more accurately!

With a reliable COULTER Automatic Threading Machine on your line, you will hold your share of today's speed-up-of-production demands! You will thread parts in a greater variety of lengths and diameters with diverse materials to more accurate specifications and far better quality than with any other threading machine built . . . and everything is automatic!



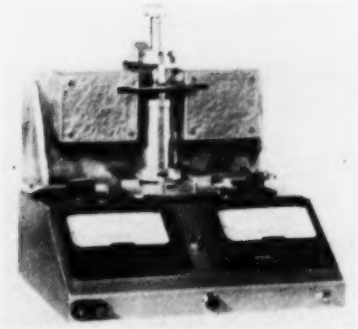
3 models for Varying Threading Operations:

1. **"H1" Hob Thread Milling Machine**
   . . . for precision, internal and external threads . . . AUTOMATICALLY.
2. **"L1" Threading Lathe**
   . . . for precision, square, standard and 29 degree threads . . . AUTOMATICALLY.
3. **"Threadmaster" Thread Milling Machine**
   . . . for precision, long and short traversing, elevating, cross feed and lead screws . . . AUTOMATICALLY.

If you are planning to purchase a threading machine, it will pay you to look into the COULTER line. We welcome opportunities to discuss your threading problems and quote on equipment engineered to your special requirements.

Machine Tool Builders Since 1896

The James Coulter Machine Co.
635 Railroad Ave. Bridgeport 5, Conn.

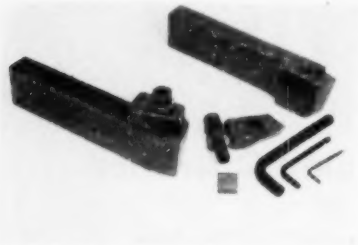


Ball Bearing Torque Tester

Baker-United Air Lines ball bearing torque tester has been developed for comparing break-away, starting, and running torque, and evaluating race roughness and dirt in precision ball bearings.

Single control enables operator to smoothly raise voltage on an eddy current motor until it just starts the bearing; a reading on a meter then gives a comparative measure of starting torque, while at reduced voltage a steady state running torque is shown. On another meter, at a selected speed amplified signals generated by race roughness and dirt indicate bearing quality. Price, $800.

Baker Co, Inc, Maplewood, Me



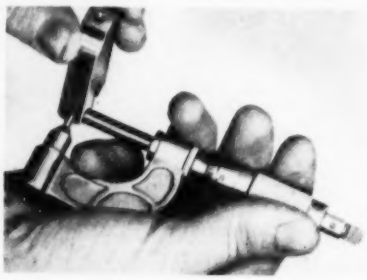
Wilson Clamp-On Tool For Turning Machines

Clamp-on tool was originally developed for use in the Wilson Manufacturing plant. It is composed of alloy steel of high tensile strength and the areas below the HSS anvil, and under the clamp-leveling screw, are flame-hardened to prevent cratering and wear. The carbide blanks are molded with a 6° clearance angle on all four sides, and diamond-lapped at the cutting edges; top and bottom of each blank is ground flat to insure proper seating when clamped. The square blank has four cutting edges; the parallelogram blank, also with four cutting edges, can be used for either right-hand or left-hand turning, utilizing two cutting edges in each direction. When all cutting edges have been used, the blanks can be reground and used again.

Features include: tungsten carbide tip with four cutting edges to use before regrinding is necessary; clamped-on tool will stand any temperature that the tool tip will; adjustable clamp with brazed-on chip breaker can be adjusted in a few seconds to the proper length for breaking the chip in a loose curl; saves time when changing tools because all that is necessary is to release the clamp screw ¼ turn and index the tip to the next cutting edge; and eliminates the necessity of high-priced diamond wheels and the operation of "grinding-in" chip breakers.

Square shanks are 1¼ or 1½ in. square; parallelogram shanks are 1 x 2 in. and 1 x 1½ in. Special sizes can be made.

Wilson Mfg Co, Inc, Wichita Falls, Texas



Micrometer

Hole-locater micrometer has round, ground and hardened anvil set at right angles to the spindle. Exact location of a hole may be checked accurately and quickly. Other uses for the Tumico hole locater micrometer are measuring the thickness of tubing, slots and grooves.

Tubular Micrometer Co, St James, Minn

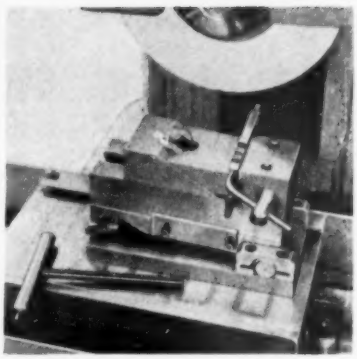
Adjustable Wrench Doubles As Vise Wrench

Utica adjustable wrenches include provision for locking the jaws at any setting. In addition, they act as vise wrenches which exert a 100-lb grip. A lever snaps over the handle and operates on the knurl to control the locking action. Pushing the button at the opposite end of the lever releases it.

When used as a vise wrench, tool is adjusted lightly on the work and locking lever is moved out until "clutch" mechanism engages the knurl. Slight clockwise turn of the lever squeezes the jaws together.

Tool is available in 8-, 10-, and 12-in. sizes and is made of alloy steel with extra-hardened jaws.

Utica Drop Forge & Tool Corp, Utica 4, NY

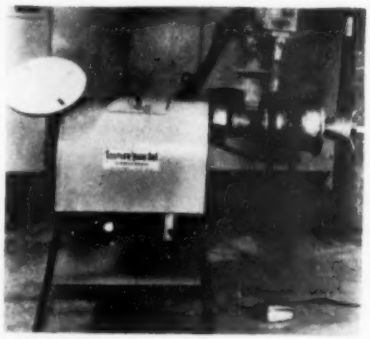


Precision Grinding Vise Holds Odd-Shaped Pieces

Vise designed for precision grinding, and square within 0.0001 in. or less in 1 in., in four positions, has been introduced. Called the J&S square perfect vise, it has an adjusting stop and down-holding clamping action for accurate positioning of work.

Clamping jaw swivels to permit holding of tapered and odd-shaped pieces. It holds round stock from 1/16 to 2½-in. dia in V-block fashion. Unit is attachable to angle plates, V-block, and sine angle plates with 0.100-in. recess for small angles. Range of jaw opening is 0 to 3 in.

J & S Tool Co, 644 W Mt Pleasant Ave, Livingston, NJ

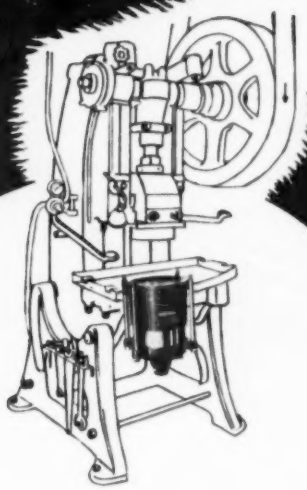


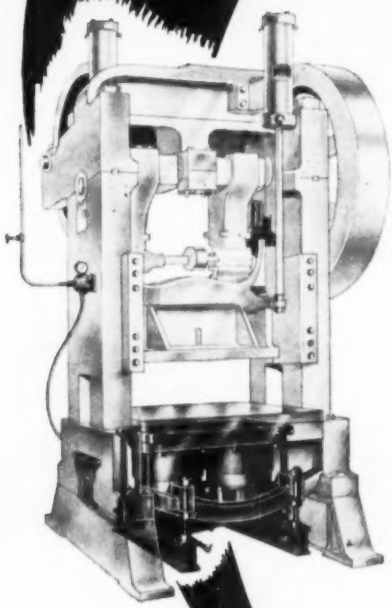
Welding Positioner

Turn-A-Weld was designed to give greater speed for both automatic and manual welding of round items from 2 in. up. Unit is adjustable to 40 speeds; footpedal controls the on-off switch.

Device features revolving table adjustable to 60° from center and 8-in. lathe chuck for welding pipe and tubing of any desired length. Incorporated is an arbor with tapered cones for welding hubs, wheels and tractor rolls. Positioner is reported to cut welding time in half.

Turn-A-Weld Products, Portland, Ore





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EQUIPMENT
for any press requirement

TELL US YOUR CUSHION APPLICATION NEEDS

Die cushion equipment for any make or size of punch press with ring holding pressures from 1 to 500 tons.

Multiple designs are available for all straight side presses, as well as a complete line of designs for all inclinables. Design and construction of all our die cushions can be provided with hardened and ground pin pressure pads.

● *Let our engineers completely analyze your die cushion requirements without obligation.*

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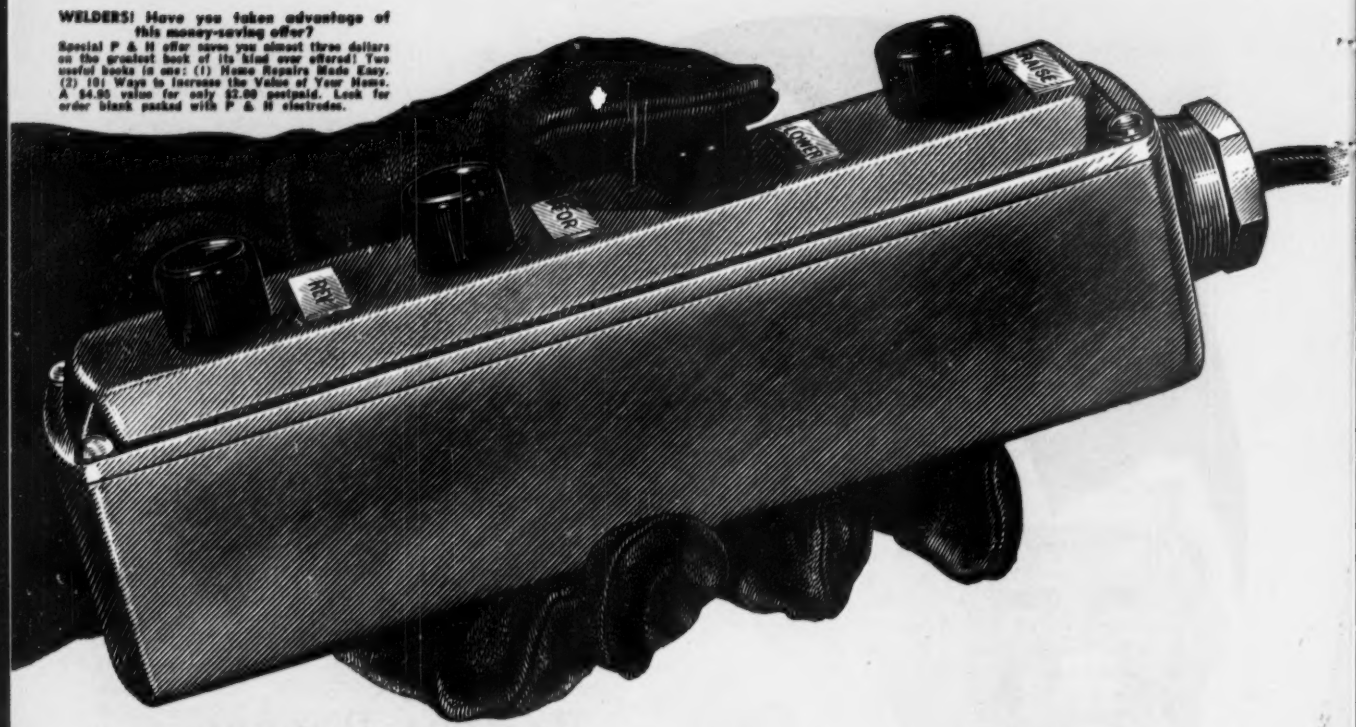
WELDERS! Have you taken advantage of this money-saving offer?

Special P & H offer saves you almost three dollars on the greatest book of its kind ever offered! Two useful books in one: (1) Home Repairs Made Easy. (2) 101 Ways to Increase the Value of Your Home. A $4.95 value for only $2.00 postpaid. Look for order blank packed with P & H electrodes.



One finger is enough

to position heavy workpieces for fast, economical downhand welding

- with P&H positioners

Cut costs as much as 50% — position the weldment, not the operator! A touch of a control button does the work — saves handling time. Welding is downhand — permits using a larger rod for faster deposition. Welds are smooth, uniform. P&H Positioners are available in capacities from 2500 to 36,000 lbs. — remote-control and hand-operated models. Ask your P&H representative or distributor for further information — or write us.

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HARNISCHFEGER CORPORATION
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TRUCK CRANES · DIESEL ENGINES · POWER SHOVELS · PREFABRICATED HOMES · ELECTRIC HOISTS · SOIL STABILIZERS · WELDING EQUIPMENT · OVERHEAD CRANES

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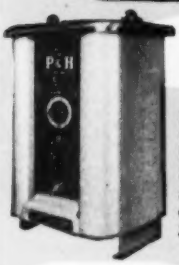
Arc Welders and Electrodes

put welding in your plant on a low-cost, high-production basis

P&H DC RECTIFIER WELDER

Has Dial-lectric Control for instantaneous heat selection at the work. Three sizes, 200, 300, and 500 amps., NEMA rated.

P&H WELDING TWINS



P&H AC WELDER

Has P&H Dial-lectric Instantaneous Remote Control. Sizes up to 625 amps., NEMA rated. Connectable to 220 and 440 volts.

P&H WN-301 Engine-Driven DC ARC WELDER

Portable. Equipped with Dial-lectric Control. Runs at only 1750 rpm. Welding service range, 60-375 amps., NEMA rated.

P&H LOW-HYDROGEN ELECTRODES

13 types that take the problem out of welding high-sulfur, free-machining, low-alloy, and high-strength steels; castings, etc.

Ask your P&H representative or distributor for complete information, or write for free bulletins.

P&H WELDING DIVISION

HARNISCHFEGER CORPORATION

4514 W. National Ave., Milwaukee 46, Wis.

Thriftmaster Builds 16-Spindle Drillhead

Straight-in-line drive, 16-spindle drillhead provides multiple drilling of a series of models of trowel handles having in-line holes with centers varying from model to model. Illustrated head has spindle range of adjustment within 1½-in. radius of their respective driving points and ¼-in. drilling capacity in cast iron. Standard and special variations are available.

Thriftmaster Products Corp, 1070 N Plum St, Lancaster, Pa

Mobilift 4000-lb Fork-Lift Truck

Mobilift Model D-424 has 4000-lb capacity at 24-in. load centers. Truck is powered by Chrysler 6-cylinder, 65-hp industrial engine and the Gyrol fluid coupling is used in conjunction with Mobilift's multiple-disk, oil-immersed clutch and constant-mesh transmission. There is no clutch pedal and there are no gears to shift —all forward and reverse movement is activated by one control.

Floor board is 23½ in. above the floor and is unobstructed; operator has free access to his seat from left or right side of the truck. Steering mechanism is a combination ball bearing worm and nut type for easy steering. All controls and instruments are functionally placed. Maintenance and service time has been reduced by a one-piece hood which is hinged

154 ideas on ways to use...

154 varied applications of molybdenum sulfide in the shop and in the field are described in a new booklet now available. This solid-film lubricant has demonstrated unique anti-friction properties under conditions of extreme pressure, high velocity, elevated temperature, or chemical attack.

The 40-page booklet contains the records of solved lubrication problems — some might solve your own.

Moly-sulfide
A LITTLE DOES A LOT

The lubricant for extreme conditions

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New York City 36 N.Y.

Please send me your Free Booklet on *Moly-sulfide*

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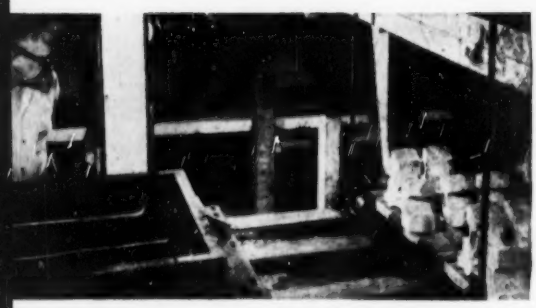
MOLY

A.M.—12 MS-6A

Picture shows how oil that forms sludge can clog cooler. Sun Quenching Oil's natural detergency helps prevent such sludge formation.

Oil Coolers Don't Clog with



A New England firm uses five 2400-3000 gallon systems to quench all types and sizes of aircraft and automotive forgings. Since Sun oil was adopted 7 years ago, not one system has required cleaning except for normal removal of mill scale.

Sun Quenching Oils keep oil coolers clean. Teardowns are fewer and maintenance costs less. This is because Sun oils have a natural detergent action that prevents the formation of sludge and aids in removing any deposits that exist.

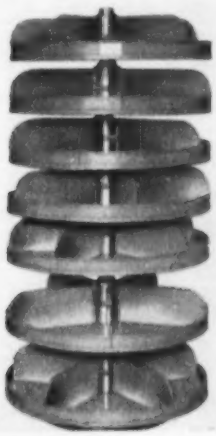
Can Handle 95% of All Quenching Jobs

Tests show that Sun Quenching Oils give better all-around results. For one thing, they assure hardnesses far above the commonly accepted minimum requirements. In any system that provides normal agitation, they can handle 95 per cent of all quenching jobs.

on the counterweight for easy access.

Wheelbase is 48 in. with an overall length of 82½ in.; turning radius is 80 in. for intersecting aisles of 69½ in. Hoisting is accomplished by a displacement type of hydraulic cylinder; ball-bearing rollers guide the telescoping channels.

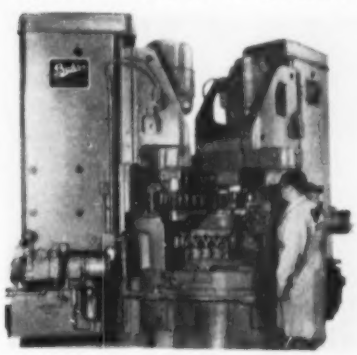
Mobilift Corp, 409 S W 13th Ave, Portland 5, Oregon



Revolving Bins

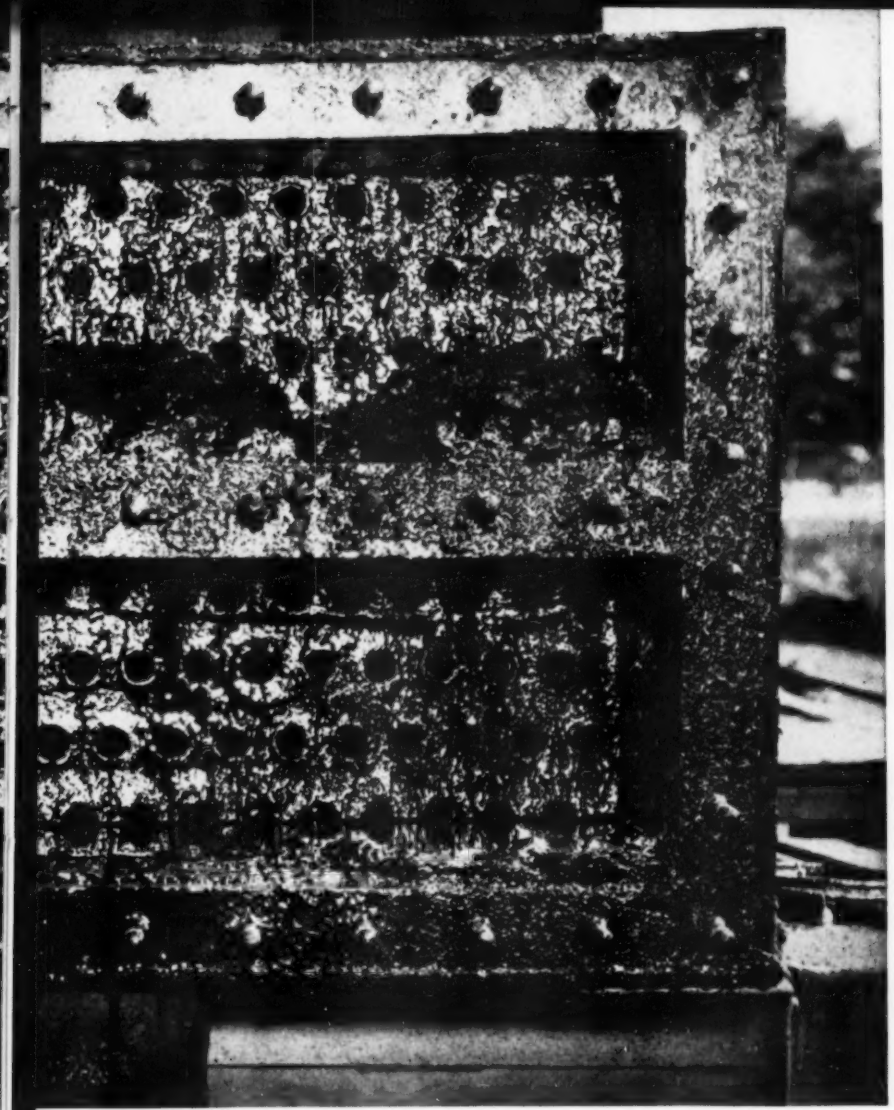
Revolving bins are complete storage units with shelves revolving easily in either direction on ball-bearing rollers. Each shelf has five permanent dividers and continuous labelholders; additional dividers can be added. Shelves are stabilized to prevent sagging when unevenly loaded. Bins are available as 7- and 4-shelf units. Diameter is 24 in.

Lyon Metal Products, Inc, Aurora, Ill



AUTOMATIC MACHINE for drilling, reaming and chamfering connecting rods processes 565 rods per hour with a single operator loading the parts manually. Parts are hydraulically clamped and automatically ejected. Eight-station holding fixture is mounted on 60 in. diameter index table and heavy-duty ball bearing construction is provided for spindles. Automatic lubrication is used throughout and machines conform to JIC standards —

Buhr Machine Tool Co, Ann Arbor, Mich



Sun Quenching Oil

Sun Quenching Oils Reduce Operating Costs

Sun oils thin out when heated, drain off parts faster and more completely. Dragout is reduced to a minimum. They do not thicken up, and under normal operating conditions need never be replaced. For more information about Sun Quenching Oils, call your nearest Sun office or write to SUN OIL COMPANY, Philadelphia 3, Pa., Dept. AM-12.

INDUSTRIAL PRODUCTS DEPARTMENT
SUN OIL COMPANY

SUNOCO®

PHILADELPHIA 3, PA. ◆ SUN OIL COMPANY LTD., TORONTO & MONTREAL

THESE 3 FREE-MACHINING ...COLD-FINISHED

LEADED NOW

MACHINES 45% FASTER THAN B1113

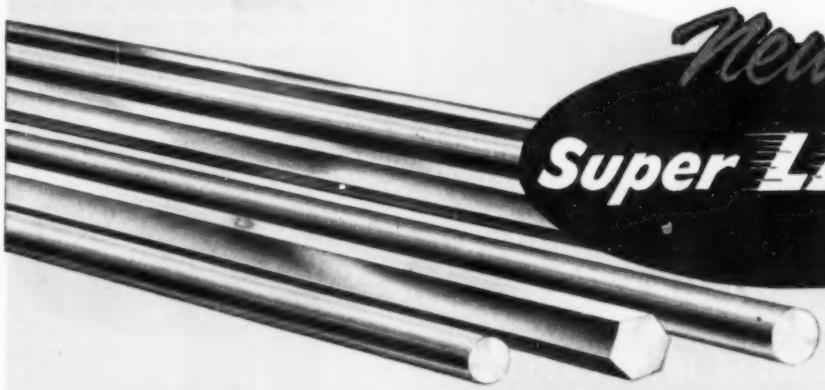
CUT YOUR COSTS WITH THESE LEADED MACHINING BARS

At last you can switch over to LA-LED lead-bearing, free-machining steel bars for additional applications. This faster machining LaSalle steel cuts your parts cost and also improves your product. And because it is an open-hearth steel, LaSalle LA-LED has the added qualities of ductility, fine finish, and satisfactory carburizing. It maintains close dimensional accuracy, and can be crimped, riveted, staked, and cold worked. Available in rounds $\frac{5}{16}$" through 3", and hexagons $\frac{5}{16}$" through $1\frac{1}{2}$".

La Salle STEEL COMPANY

Manufacturers of the Most Complete Line of Cold-Finished Carbon and Alloy Steel Bars in America!

STEEL BARS AVAILABLE!



New! **Super LA-LED®**

ACTUALLY REPLACES BRASS!

MACHINES 80% FASTER THAN ORDINARY SCREW STOCKS

New!

LEADED ALLOYS

.20 Carbon—.40 Carbon

ALL THE PROPERTIES OF ALLOY BARS PLUS GREATER MACHINABILITY!

Now you can get both Leaded 8620 and Leaded 4140 cold finished steel bars. Being leaded, they machine one-third faster! Heat treating characteristics, hardenability, and mechanical properties are not appreciably affected by the addition of lead.

Here is the fastest machining steel ever commercially developed—Super LA-LED. Its exceptional machinability permits its use for those parts which previously could be machined economically only from brass. Since machine capacities so often limit the daily production of brass parts, you can now use Super LA-LED and obtain production approaching that of brass—and drastically cut the part cost.

Send for **these Bulletins**

LA SALLE STEEL COMPANY
1416 150th Street
Hammond, Indiana

Please send me the following La Salle Helpful Data Bulletins:

☐ LA-LED #9 ☐ Super LA-LED #12 ☐ LEADED ALLOYS #14

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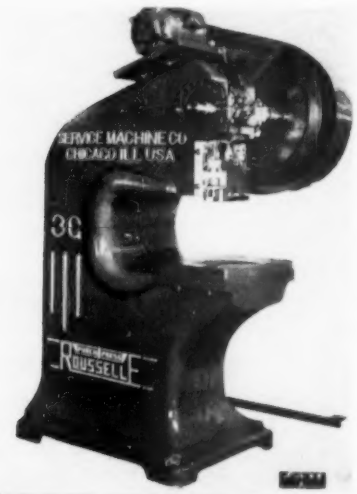
85TH ANNIVERSARY 1868 ... 1953 COMPANY

Dial Bore Gages

Rimat Tool Company dial bore gages feature interchangeable gage heads. All standard gage heads for measuring "0" ring grooves, snap ring grooves, pitch diameters of internal threads and small bores are interchangeable on one gage body.

Rimat Tool Co, 21 West Dayton St, Pasadena 2, Calif

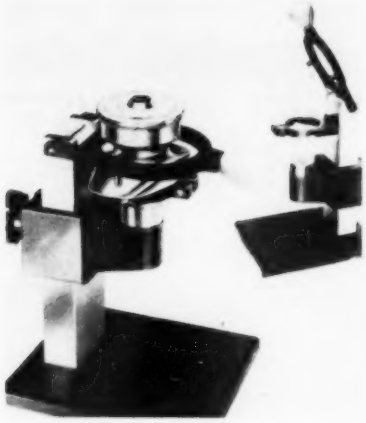


Rouselle Punch Presses In 5- to 40-ton Capacities

Line of Rouselle punch presses, including horn, deep-throat, and open-back inclinable presses with capacities of from 5 to 40 tons has been designed for wide versatility of operation and maximum safety.

The 25-ton deep-throat model illustrated permits working to the center of 36-in. sheets. Frames are extra-heavy, one-piece, semi-steel castings, designed so that bed protrudes from frame allowing greater clearance. Automatic knockout bar and single-stroke clutch are standard equipment on all units.

Service Machine Co, 7625-35 S Ashland Ave, Chicago 20, Ill



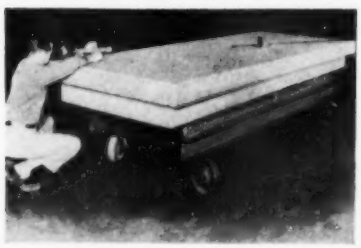
Bench Adapter Speeds Mass Production Testing

Bench adapter has been designed for the Newage portable metal hardness tester for production line work.

After adapter is placed on the worktable, with tester in position, part to be tested is put on anvil provided. Operating lever is lowered and extension arms come in contact with tester's handgrips. By applying even pressure on lever, handgrips are depressed, lowering tester's indentor into the metal. When lever reaches its lowest point, the operator can obtain a direct reading of tested part's hardness from the dial. Tests can be made speedily and accurately while sitting or standing.

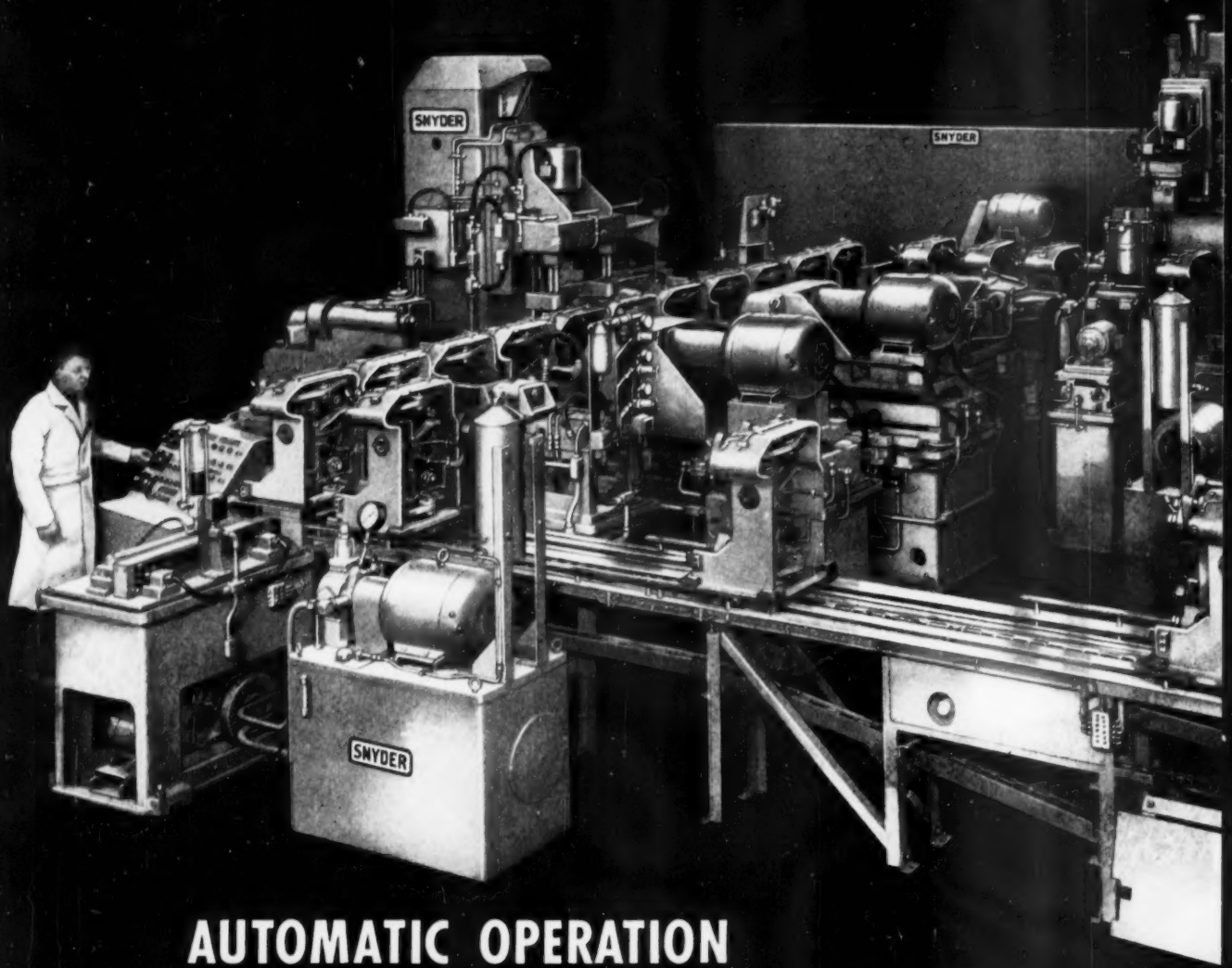
The 30-oz tester, which can be quickly removed from bench adapter for use elsewhere, is individually calibrated to Rockwell A, B, C, or 15N ranges, Brinell medium or low ranges. Price of bench adapter and one anvil, $49.50; price of portable hardness tester, $235.

Newage International, Inc, 235 E 42nd St, New York 17, NY



MICROFLAT has introduced a line of grey granite surface plates to supplement its line of premium black granite plates. Same accuracies prevail for the grey granite but costs run to 21% less. Grey granite sizes range from 12 x 18 in. to 48 x 72 in. in 2- and 4-clamp edge types. Surface accuracies are finished down to 0.00005 in.— *Collins Microflat Co, 2326 E 8th St, Los Angeles 21, Calif*

SNYDER MACHINES CONTROL COSTS

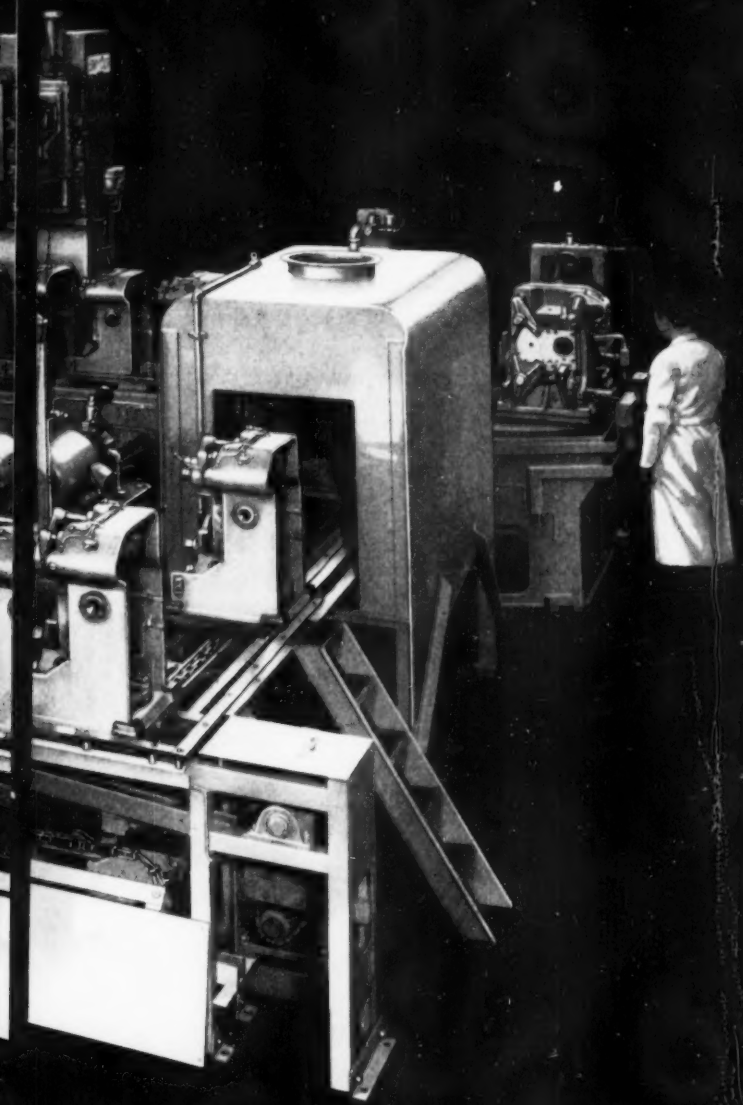


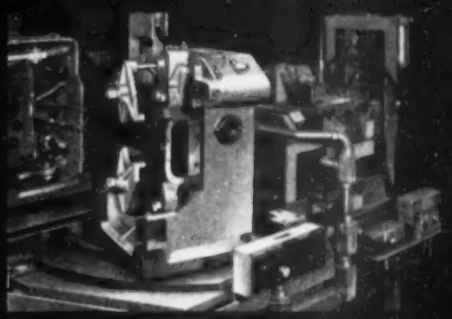
AUTOMATIC OPERATION

MILLS, DRILLS, TAPS, BORES, COUNTERBORES, COUNTERSINKS FRONT COVERS FOR AUTOMOTIVE ENGINES • AUTOMATIC INDEXING; LOCATING, CLAMPING, AND RELEASING • AUTOMATIC TRANSFER THROUGH TWO-STAGE, CONTINUOUS WORK CYCLE • AUTOMATIC CONTROLS • AUTOMATIC SAFETY INTERLOCKING SYSTEM • AUTOMATIC LUBRICATION • AUTOMATIC CLEANING AND CHIP REMOVAL • SKILLED OPERATORS NOT NEEDED

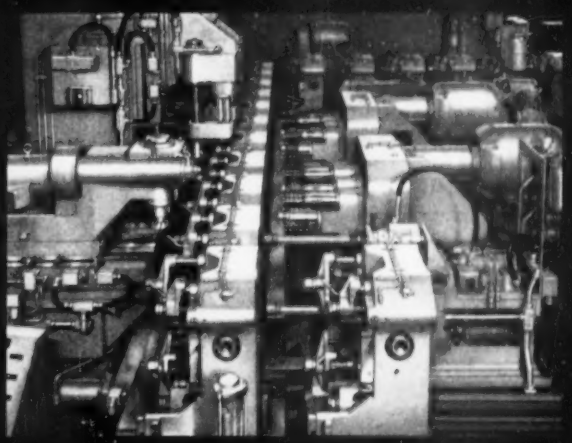
18 STATION AUTOMATIC TRANSFER

180 FRONT COVERS AN HOUR AT 100% EFFICIENCY





At Station 18 the fixture is rotated 90°, air wrenches unclamp the part so that it is easily removed. The fixture returns to Station 18, engages the return conveyor, is automatically blown clean and returned to the loading station.



Fixtures leaving Section 1 (above) move at right angle so that the other faces and top of the part are exposed to tools. The part enters the work cycle with three ground faces, leaves it ready for assembly.

SNYDER

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E. LAFAYETTE

TOOL & ENGINEERING COMPANY

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Wherever parts are assembled with screws, nuts, bolts or rivets, the use of Keller Tools speeds up production, reduces costs, and makes work easier.

For example, in assembling record players (shown above), changing to Keller Air Tools made the work easier and faster, and substantially reduced production costs.

FACTS IN BRIEF

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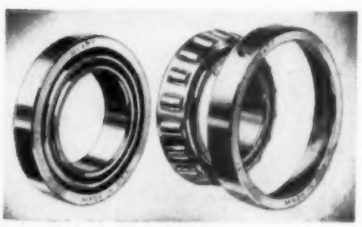
Spike-Studded Conveyor Pulley Eliminates Slippage, Adjustment

Sheehan conveyors are equipped with a positive-drive spike-studded pulley at drive end of belt which eliminates slippage and necessity of adjustment of belt due to heat expansion; operations are unaffected by high temperatures.

Minimum under-clearance of 6 in. top of belt eliminates need for pits under forge and stamping presses. Units are designed to specifications for stationary or adjustable-height uplift conveyors requiring minimum floor space to move normal loads 30 ft per minute or faster.

R T Sheehan Co, Plymouth, Mich



Hyatt Barrel Bearings Available in Volume

Self-aligning barrel bearings, developed by General Motors' Hyatt Bearings Div, are now available in volume quantities for general industrial applications.

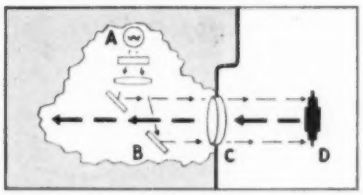
Accurately-ground barrel-shaped rollers, combined with precise race contours, are designed to provide maximum load-carrying capacity throughout a wide range of operating conditions. Angular contact bearings sustain radial, thrust, or combinations loads; conditions of shaft misalignment do not interfere with operation.

Hyatt Bearings Div, General Motors Corp, Harrison, NJ

Plain Pointers on Projection

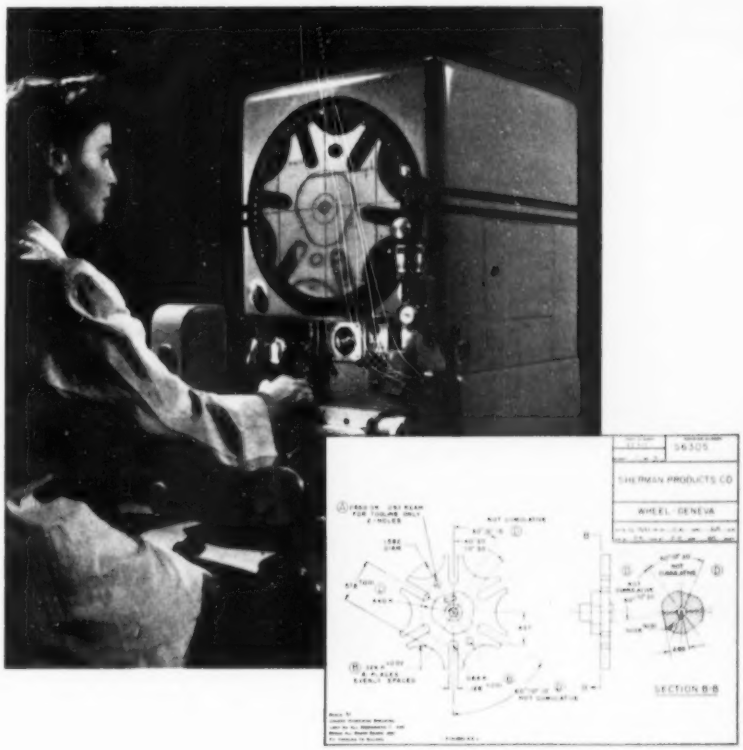
ONE of the basic precepts of the study of geometrical optics is that the angle of incidence equals the angle of reflection. This law, recognized by the Greek philosophers and refined by later investigators, has an important bearing on modern optical gaging by projection. In numerous instances it is desirable to project the surface of a part on the screen to check the position and size of recesses or to measure features which may not permit conventional profile shadow images. The ease and success with which this is done depend not so much on how much light is thrown on the part as on how much of this light is reflected back into the instrument's lens.

Traditionally, surface illuminators used with contour projectors have been placed at an angle on each side of the lens or optical axis. This was true of the pilot model of the Kodak Contour Projector and we frankly admit it proved somewhat less than perfect. Since the light struck the part at an acute angle, it was reflected from the surface at a similar angle—reflected away from the lens, as it were, when the part was normal to the lens for a distortion-free image.



However, between design of this pilot model and our production models, our optical engineers devised a radically different system. As shown here schematically, this consists of a 1000-watt lamp (A) so mounted that its light is reflected by a mirror (B) through the front lens (C) of the instrument. Since the light from this surface illuminator travels along the axis of the lens, it is reflected from a part (D) back through the lens with negligible loss. By staging the part to be measured perpendicular to the optical axis, the angles of incidence and reflection approach zero degrees. Light is reflected from the part back on its own path.

This permits inspection of deep recesses and results in a screen image of unusual brilliance when projecting surfaces. The latter we have frequently demonstrated by placing the works of a small watch on our contour projector. Spectators are generally impressed to see the wheels and gears in motion, and on at least one occasion we've had a watch brought to us for repair. While this was perhaps somewhat embarassing, we're reconciled by the thought that users of our projectors are saved embarrassment daily because of the accuracy with which they can gage parts to "tenths."



Inspection costs fall when surface features and profiles are checked simultaneously

YOU may be missing a chance to lower inspection costs, speed the work, if you're overlooking the surface illumination feature of the Kodak Contour Projector.

Take the Geneva wheel shown here. By optical gaging, 47 dimensions are checked to tolerances of .001" in *less than 60 seconds,* using a single chart-gage and a simple staging fixture. Conventional shadow projection is used to check 36 of these. But only through surface projection can the 11 dimensions of the hub, including five angles and three radii, be checked simultaneously. A flick of a switch and the unique, self-contained surface illuminator (described in the column at the left) makes checking surface details as easy as measuring shadow profile.

The inherent speed and accuracy of inspection and measurement on Kodak Contour Projectors are lowering inspection costs on all sorts of parts, simple and complex, large and small. The field representative in your area will be glad to show you how optical gaging can work for you. To get in touch with him, or for a copy of a booklet, "Kodak Contour Projector," write to:

Special Products Sales Division
EASTMAN KODAK COMPANY
Rochester 4, N. Y.

the KODAK CONTOUR PROJECTOR

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A new sound movie, Optical Gaging, shows how to simplify complex inspection problems. We'll tell you how to get it for a showing.

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(Advertisement)

KENNAMETAL
"BUTTON" TOOLS

Mounting Screw permits easy rotation of insert without changing tool setting
Sturdy Kennametal insert—indexable to several cutting positions
STYLE PRC
STYLE SDH
STYLE RDH

UNBUTTON
Production Tie-Ups

Get acquainted with this new tooling technique that handles jobs ranging from profiling to planing—gets more work done with less carbide, uses simplified tool designs, and greatly reduces grinding expense. Here are typical applications:

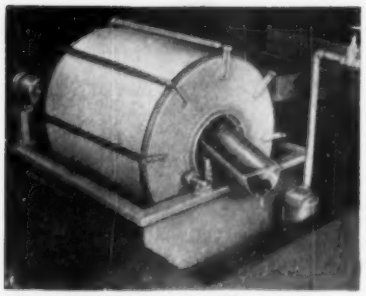
PLANING: Machine tool builder reports heavy duty button tools cut time of planing 15-foot gray iron castings from 86 to 41 minutes.

BORING: Car wheel maker records up to 200 wheels bored before set of four heavy duty Kenna metal buttons need resharpened.

PRODUCTION JOB: Tractor accessory shop faces to length and chamfers both ends of more than 3600 actuating cylinders with set of three buttons.

Performance reports on these and other "button-tooled" jobs will be sent—or our field engineer will give you complete information—on request. Kennametal Inc., Latrobe, Pa.

KENNAMETAL
CEMENTED CARBIDE TOOLING
THAT INCREASES PRODUCTIVITY

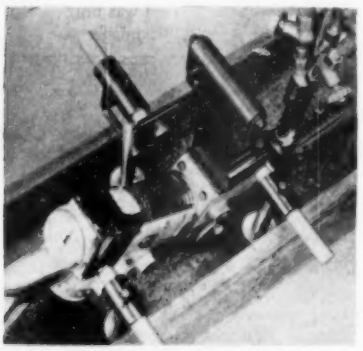


Compact Automatic Filter Has Long-Life Wire Screen

Murray-Way filter automatically rotates fresh filtering area into position while simultaneously ejecting contaminant cake. Wire filtering screen, said to have many times the life of the finest cloth filtering webs, can be supplied in monel, stainless, brass, or bronze to fit all requirements.

Filter may be used on an individual machine unit or as a central filter for many units. Gallon capacity may be increased by adding drums in tandem, separately or in the same tank to meet requirements.

Murray-Way Corp, Birmingham, Mich

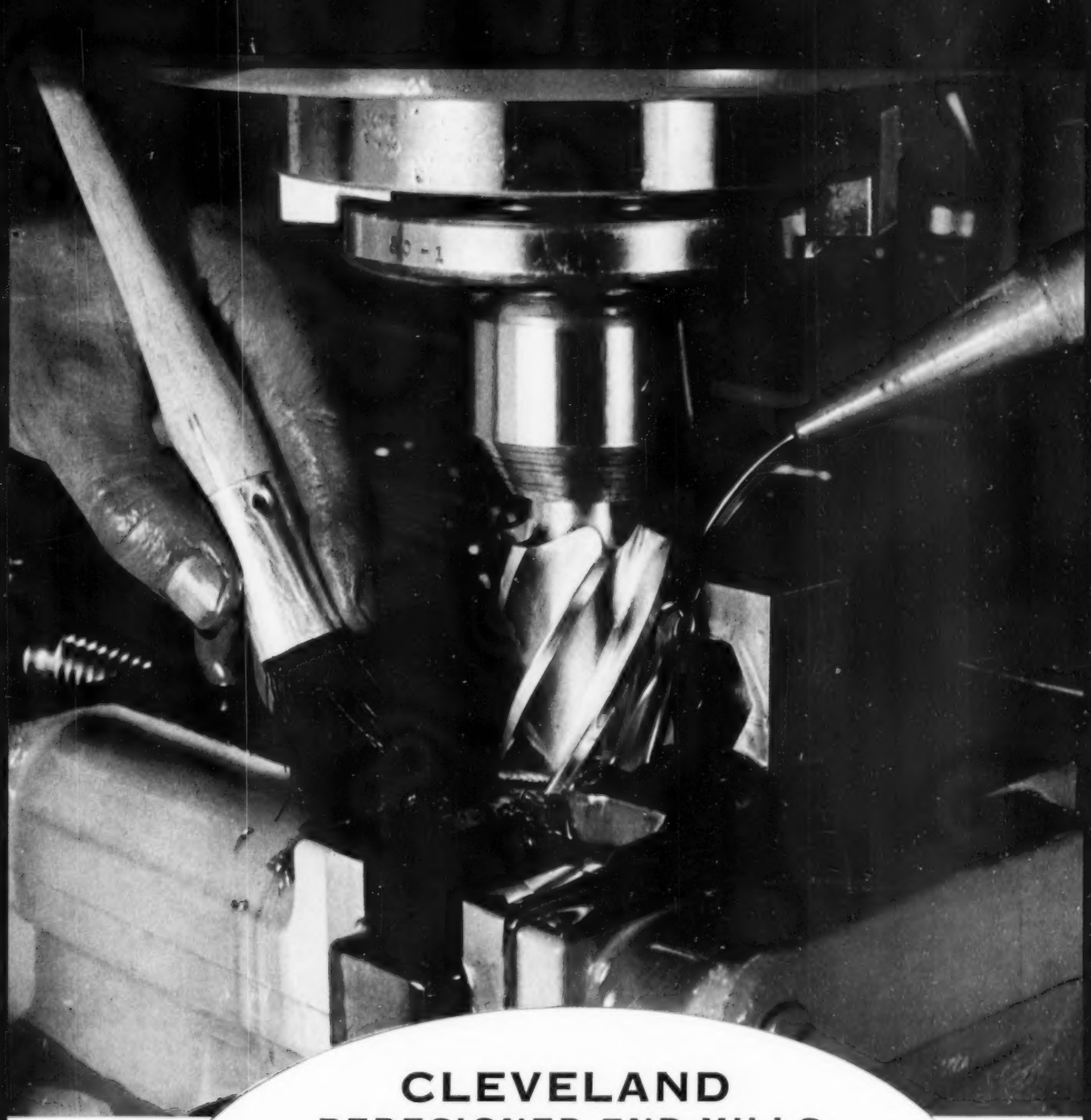


Flame-Cutting Machine Is Designed for Cutting I-Beams

Model HP Cadet flame-cutting machine has been designed for making clean, accurate longitudinal cuts through webs of I-beams and wide flange beams. Guided by three lateral adjustable rollers, unit makes straight longitudinal cuts on beams from 5½ up to 11¾ in.

Machine can also be used for making straight cuts or cutting limited irregular shapes from plates. Rollers run along a 1½ to 2½-in. steel strip or angle iron previously fastened to the plate. Speed of travel and gas flow to the torch are controlled by fingertip adjustments on the handle. Units are adaptable for use with acetylene, propane, or hydrogen gases. Weight, including guide rollers, is 29 lb.

American Pullmax Co, Inc, 2455 N Sheffield Ave, Chicago 14, Ill



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Greater accuracy • Stronger • More durable

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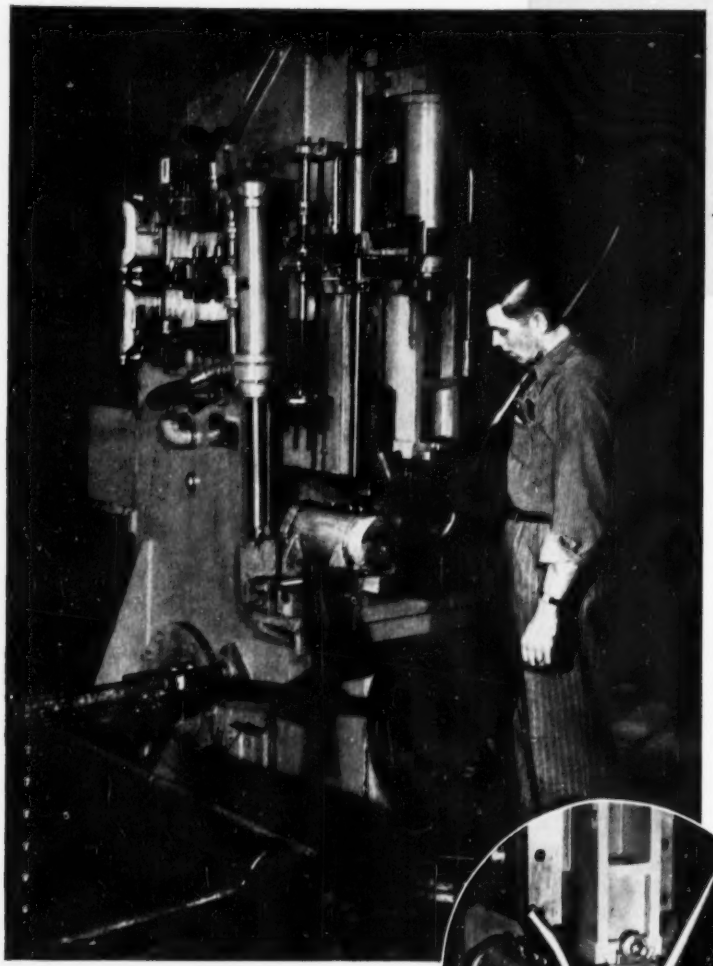
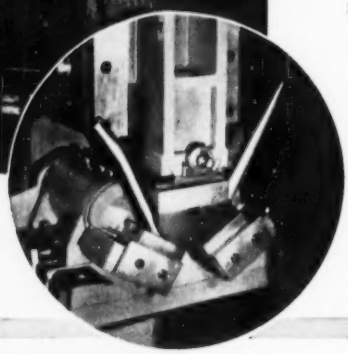
New PINES 20-TON BENDING PRESS

PRODUCES AUTOMOTIVE EXHAUST PIPES

50% FASTER





Production view of new Hydraulic Bending Press now producing, in a single setup and with one operator, 4 to 8 multiple bends on automotive exhaust and tailpipes at speeds from 600 to 800 bends per hour.

◀ Closeup view of Pines Bending Press forming 4th bend in a 1⅝" (16 ga.) CRS automotive exhaust pipe. Note how wing dies are controlled by side-mounted cushions through heavy crank arms. Interchangeable pick-off turret of angle-of-bend selector saves set-up time on repeat jobs.

The new Pines 20-Ton Hydraulic Pipe and Tube Bending Press is now establishing new records of production efficiency on many different bending operations. For example, on automotive exhaust and tailpipes, multiple bends with 4" and 6" radii are now produced in 1-1/4" to 2" O.D. 16 ga.-18 ga. tubing at speeds ranging from 600 to over 800 bends per hour.

On an over-all basis, current results show these jobs are produced 50% faster than with ordinary bending press equipment. At the same time, because of the design of the Pines, savings up to 30% in setup time are effected. Further, because more jobs can be handled in a single setup, there's a substantial reduction in tooling expense. If you have work adaptable to a bending press, it will pay you to see Pines today.

CHECK THESE COST-CUTTING PRODUCTION FEATURES

- **Twin Equalizing Side-Mounted Cushions** — provide greater working clearance, maintain constant torque, reduce flattening and distortion.
- **Faster Cycling** — angle-of-bend selector indexes and resets to starting position automatically without indexing through idle stations, increases output.
- **Greater Work Handling Capacity** — extra clearance reduces number of setups on multiple bending, permits broader use of uniform radii, cuts tooling and production costs.
- **Interchangeable Pick-Off Turret** — for angle-of-bend control. Permits storing and remounting for repetitive jobs, reduces setup time.
- **Adjustable Ram Speed Control** — assures efficient operation, simplifies setups. Ram can be lowered slowly or stopped at any point.

WRITE FOR NEW 4-PAGE BULLETIN

Write today for free bulletin completely illustrating and describing the new Pines Bending Press and its cost-cutting production features.

PINES ENGINEERING CO., INC.

Specialists in Tube Fabricating Machinery | 671 WALNUT • AURORA, ILLINOIS

PRODUCTION BENDING • DEBURRING • CHAMFERING MACHINERY

Conveyor Chain

Duraflex 2½-in.-pitch drop-forged conveyor chain has an ultimate strength of 37,500 lb, claimed to be considerably stronger than other chains of the same pitch. It is flexible in four directions and there are no riveted pins.

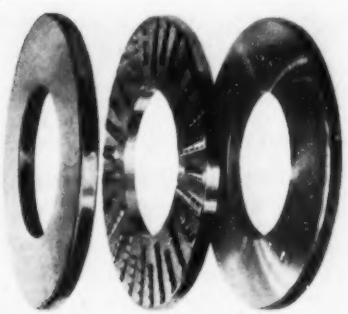
Jervis B Webb Co, Detroit, Mich

Heavy-Duty Hydraulic PowRarm Has 1000-lb Carrying Capacity

Heavy-duty hydraulic PowRarm with carrying capacity of 1000 lb has been added to the Wilton line of positioners.

Unit may be used vertically, as illustrated, mounted to the side of a workbench, or horizontally. Unit has a slotted base for use with drill-presses, shapers, and milling machines for machining operations at compound angles. Hydraulic action permits operator to make a change of position under partial tension to prevent work from accidentally falling.

Wilton Tool Mfg Co, 925-941 Wrightwood Ave, Chicago 14, Ill



THRUST BEARING has modifications claimed to raise load capacity by 9% and life by 29%. Design sets long roller slots of five rollers in alternate positions with short roller slots of four rollers. Retainer is centrifugally cast bronze — *Rollway Bearing Co, Inc, Seymour St, Syracuse, NY*

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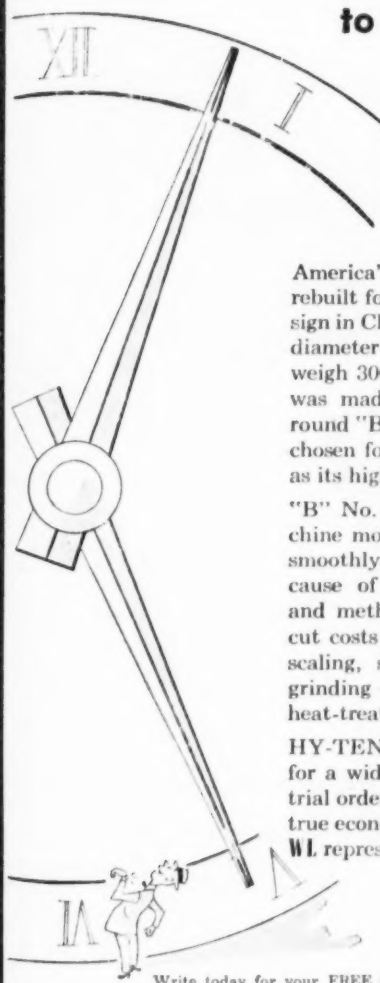
it's the right time

to Investigate the Qualities of HY-TEN ALLOY STEEL



America's largest clock was recently rebuilt for a spectacular illuminated sign in Chicago. It measures 50 ft. in diameter — hands and movement weigh 3000 lbs. The new driveshaft was made from 6 ft. of 3½-inch round "B" No. 3X heat-treated bar, chosen for its machinability as well as its high physical properties.

"B" No. 3X heat-treated bars machine more readily and finish more smoothly than standard alloys because of their particular analysis and method of manufacture. They cut costs by eliminating distortion, scaling, straightening — and often grinding — as well as the cost of heat-treating finished parts.

HY-TEN "B" No. 3X bars are used for a wide range of applications. A trial order will convince you of their true economy. Just call your nearest WL representative.

Write today for your FREE COPY of the Wheelock, Lovejoy Data Book, indicating your title and company identification. It contains complete technical information on grades, applications, physical properties, tests, heat treating, etc.

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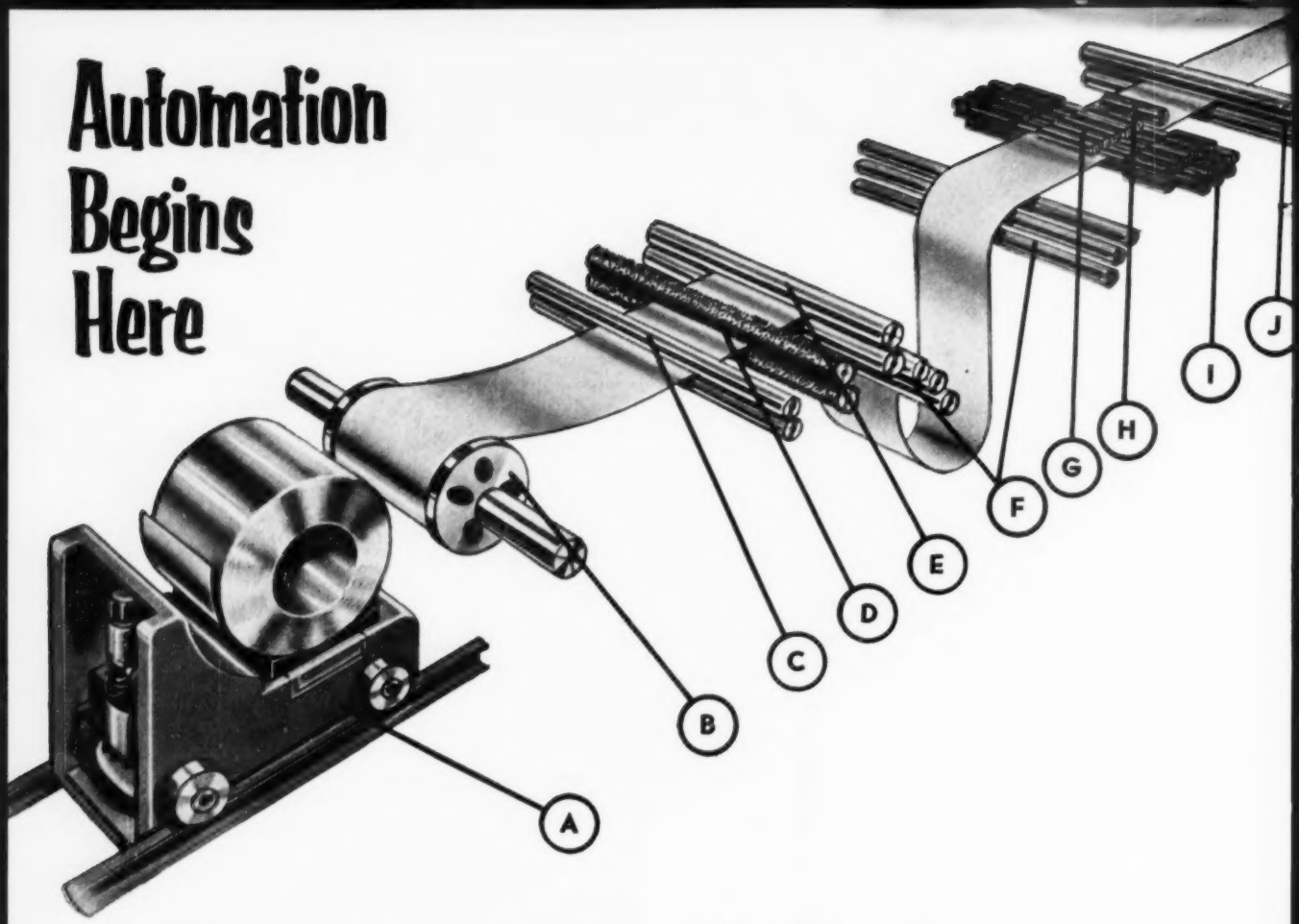
Automation Begins Here



Automation—the automatic handling of work in process — permits manufacturers to combat high labor and material costs by boosting man-hour production. McKay has played a large part in this movement by designing and building "automated" equipment for the automotive and steel fabricating industries.

For example, coil feed lines of the type illustrated above were designed and built by McKay for several leading automotive firms. They are used to automatically feed coil stock into square shears or blanking presses, thus eliminating inefficient and laborious methods of manually feeding these machines.

TYPICAL LINE EQUIPMENT

(A) Hydraulic Loading Car for stand-by coil.

(B) Cone Type Coil Holder handles wide range of coil I.D.'s and O.D.'s.

(C) Guide Rolls to direct strip into brush rolls.

(D) Brush Rolls with solvent sprays to clean strip.

(E) Driven Pinch Rolls for pulling coil stock and filling storage loop.

(F) Guide Rolls to support loop.

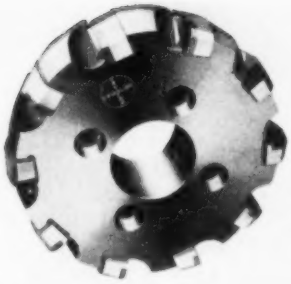
(G, I, J & H) Feeder unit consisting of Backed-Up Leveler **(G-I)** and pinch rolls **(J)** is powered by D.C. drive which is controlled by a measuring device driven from measuring rolls **(H)**. The feeder flattens the strip and accurately measures it into open press dies or through shear knives.

Line operation is synchronized with the press or shear for maximum production. McKay builds these units with design, speed, and capacity dictated by your job requirements.

The McKAY MACHINE *Company*
YOUNGSTOWN, OHIO

McK

ENGINEERS AND DESIGNERS OF EQUIPMENT FOR THE AUTOMOTIVE, FABRICATING AND STEEL INDUSTRIES

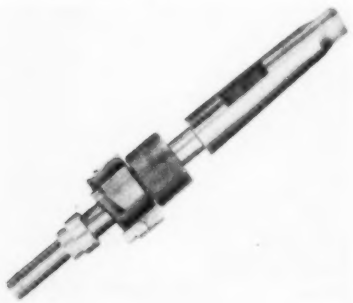


Kroslok Face Milling Cutter Is Cross-Serrated for Rigidity

Motch & Merryweather has introduced a line of milling cutters, designated Kroslok, composed of three basic parts: body, blade, and wedge. Cross serrations on one side of body channel mate with similar serrations on blade to assure rigid holding of blade in the body. Wedge is driven between smooth side of body channel and blade after cross-serrated pattern is mated.

Two basic body types are available—general purpose, and heavy duty, both for ferrous and non-ferrous applications. Weight distribution design obtains a fly-wheel effect; heavy construction prevents body distortion; chip groove keeps work cleared. High-speed steel, and cemented carbide-tipped blades can be furnished, 3 through 18-in. dia, special sizes available.

Motch & Merryweather Machinery Co, Cutting Tool Mfg Div, Penton Bldg, Cleveland 13, Ohio



Boring Bars for Radials Hold Jig Bore Tolerance

Standard line of Belock precision bore bars is designed for use in any radial or multiple spindle drillpress enabling finish boring operations to be done on the spot. Boring can reportedly be done in one-tenth the time previously required for boring accurate diameters in castings; if casting is sufficiently cored, up to ½-in. of material can be cut at one time.

Bars will bore any diameter from

RE-ORDERS

PROVE THE VALUE OF

Sibley's Model C-20 Drilling Machines!

Nothing demonstrates customer satisfaction more than repeat business—and judging from the repeat orders for the Model C-20, customers have found it to be a real cost and time saving investment.

On the market now for two years, this 20" swing machine has been tested in toolrooms and on production in hundreds of plants—and customers acclaim it as the finest drilling machine for its capacity they've ever operated.

There are good reasons for this acceptance! Operation is so effortless—geared power feeds are selected by turning a knob; spindle speeds range from 65 to 1360 R.P.M.; its capacity of 1¼" in mild steel handles a large variety of drilling jobs.

2 TO 3 WEEKS DELIVERY!
No lengthy waiting for your order.

OTHER SIBLEY MODELS
Model E-25 medium weight with 25" swing and ¾" capacity in mild steel. Heavier Models D-24 and D-28 in 24" or 28" swing with 1¾" capacity.

Don't Delay —write for specifications today!

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PRECISION—strips less than .025" wide accurately sheared, thousands of parts exactly duplicated.

CUTTING SPEED—ranges from 30 to 200 S.P.M. on Vari-O-Speed models—continuous or single stroke operation.

RATED CAPACITY—16 gauge steel.

EASY TO OPERATE—a woman can operate it.

CHOICE OF MACHINE—two Vari-O-Speed models. Also two Standard Models running at set speeds.

MINIMUM OPERATOR FATIGUE—especially designed for use where a high rate of production must be maintained.

ENGINEERING SERVICE—always at your disposal.

RUGGEDLY BUILT—backed by one year warranty.

DELIVERY—immediate on most models.

COST—that's good too.

*pronounced Die-ack-ro.

SEND FOR CATALOG

Gives full details on both hand and power operated Di-Acro Shears, Benders, Brakes, Rod Parters, Notchers, Rollers and Punch Presses.

Creators of "Die-Less Duplicating"

O'NEIL-IRWIN MFG. CO.
311 Eighth Avenue
LAKE CITY, MINNESOTA

di-acro PRECISION METALWORKING MACHINES

1.250 in. min to 5.812 in. max; custom bars are available on special order for larger diameters. Multiple bars to bore and counterbore in one operation are standards to do any long- or short-step combination. Rigid carbide cutting edges are provided, and absolute concentricity is said to be assured. Hardened and ground stop collars govern depth of cut and eliminate overrunning counterbore depths.

Simple pilot fixtures are used in place of large, expensive jigs. Hardened, ground bushings in fixtures accurately locate coordinate centers and give absolute uniformity in every casting set up on fixture. Special cutters and custom single-fluted bore reamers are available for boring of smaller diameters or milling special shapes, contours, and angles.

Belock Instrument Corp, 111-01 14th Ave, College Pt, Long Island, NY

Diamond-Impregnated Tool Does Wheel Forming, Dressing

Tool developed by Wheel Trueing Tool Co, named diamond grit form block, consists of diamond-surfaced block of matrix material molded in reverse of shape required in abrasive wheel. Tool reportedly produces required form in fraction of usual time because many diamonds are in contact with wheel.

Wheel Trueing Tool Co, 3200 W Davison, Detroit, Mich

Burgess No. 210 Size D heavy-duty industrial flashlight battery is said to have a greatly extended service life. After 12 months of shelf storage, battery is said to retain an unusual amount of fresh power. Unit is sealed in steel and plastic.

Burgess Battery Co, Freeport, Ill

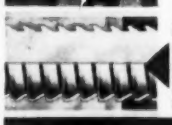
Drill jigs and other fixtures are simpler, cheaper, smaller when made for use in a SPEED VISE. Instead of a cumbersome and expensive box jig, with a SPEED VISE it is only necessary to make a simple jaw plate to fit the part being machined and hold drill bushings, etc.

QUICK ACTION DESIGN The fastest acting vise you've ever seen. One hand operation—lift . . . slide . . . lock . . . that's all there is to it.

STANDARDIZED HOLES for attaching jigs or jaw plates are provided in the jaws of all SPEED VISES.

HARDENED STEEL is used on the screw and locking nut to provide minimum wear and extra long life.

HEAVY SEMI-STEEL CASTINGS for extra strength and a heavy base plate for rigidity are part of the SPEED VISE construction.



PATENTED THREAD FORM of the screw and nut is a steep undercut. Screw is held positively in the nut when the vise is clamped.

Write for Bulletin No. 24-AM

CARDINAL MACHINE COMPANY

1819 Dana Street
Glendale, California

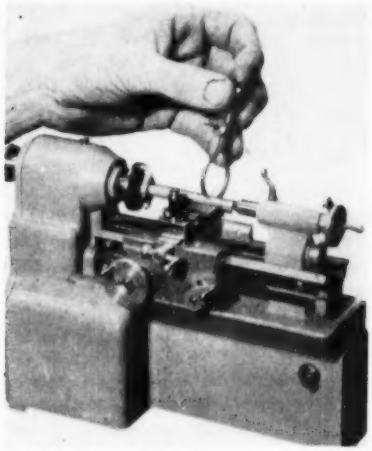
Ball Bearing Pillow Blocks Available in Economy Package

Series of light-duty, low-cost ball bearing pillow blocks, designated Type PB, has been introduced by Fafnir Bearing Co.

Complete, ready-to-mount package includes a separable, two-piece pressed steel housing, pre-lubricated, wide inner ring ball bearing with self-locking collar, and contact-type Plya-Seals to provide efficient grease retention and contaminant exclusion to minimize maintenance.

Housing, said to occupy less space than other pillow blocks for the same shaft size, is designed to provide initial self-alignment in all directions, and to assure ample strength for light-duty applications.

Fafnir Bearing Co, New Britain, Conn



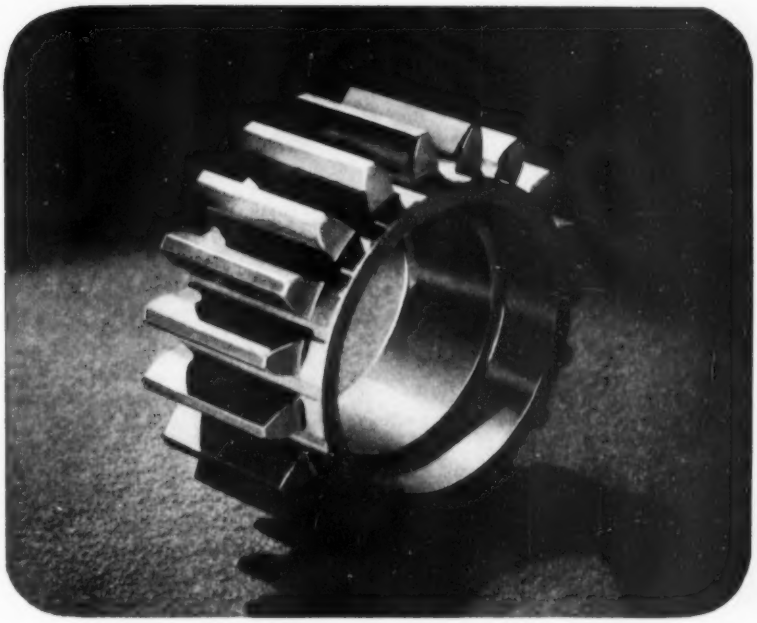
Metal-Cutting Lathe Weighs Less Than 12 lb

Master portable precision metal-cutting lathe takes work up to 4 in. in length between centers, has 3-in. swing, and ⅛-in. collet capacity.

Unit measures 10½ in. in length, 3¾ in. wide, 7¼ in. high, weighs less than 12 lb. Built-in, 110-v ac fan-cooled motor mounted in base has 6-ft cord, and switch.

Lathe is equipped with 1¼-in. driver plates, two lathe centers, toolpost, spacer and rocker, adjustable tailstock, toolbit, lathe dog, test rod, and Allen wrench.

MasterSon Engrg Co, Box 4016, Los Angeles 24, Calif



IN ONLY 3½ DAYS

"PUTTIN'-ON-TOOL"

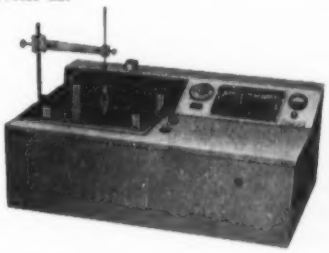
saves leading press manufacturer $2100 on spur gears

The bore diameter of flame-hardened precision gears like the one above used to be a costly problem for R. Hoe & Co., Inc., one of the leading manufacturers of large newspaper presses.

Constant orders for this particular gear, each specifying the bore diameter to extremely close tolerances, had to be met. Since manufacturing costs exceed $26.00 per gear, neither making up specials—nor annealing, reboring, and rehardening—was an economical solution. What HOE needed was a "puttin'-on-tool."

That's exactly what they have in their new Chromaster Industrial Chrome Plating Unit, which they use to adjust the bore diameter of stock gears to specification. Recently in a 3½ day period they were able to plate 81 of these gears with chrome deposits ranging from .0002" to .005" at a saving of $2100.

Chromaster can save you money, too. Write us.



CHROMASTER SALVAGES undersized parts, worn tools and gages right in your own shop. It's so simple to operate that no previous plating experience is needed. The chemically stable plating solution is deposited at a rate of .002" per hour for a cost of 7 mils per sq. in. One of six models will meet the requirements of every shop.

Chromaster

Industrial Chrome Plating Units—20, 50, 150, 250, 500 and 1000 amp. units

Ward Leonard Electric Co
Industrial Chrome Division
17 South Street,
Mount Vernon, N. Y.

Please send me information on industrial chrome plating with CHROMASTER.

COMPANY_____

NAME_____ TITLE_____

ADDRESS_____

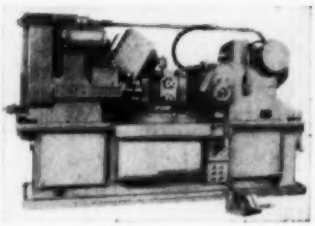
CITY_____ ZONE____ STATE____

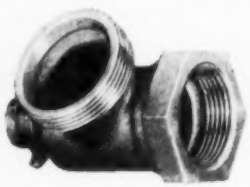
...and parts are finished without rehandling on

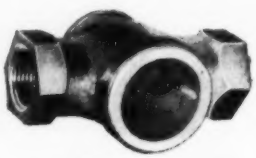
GOSS & DeLEEUW AUTOMATIC CHUCKING MACHINES

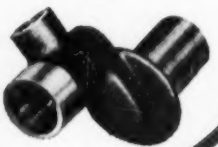
The Goss & DeLeeuw "One-Two-Three" Chucker differs from the conventional machine in that it provides the means of machining more than one end of a piece in a single handling instead of requiring several handlings and set-ups. A worthwhile gain in production time is assured.

In the "1-2-3", work is gripped in chuck and all ends machined either in sequence or simultaneously. Goss & DeLeeuw and only Goss & DeLeeuw offers this feature in a standard chucking machine.









A few typical parts finished on this machine are shown here. Write for detailed description . . . send samples of your work for time and cost estimates.

GOSS & DeLEEUW
QUALITY PRODUCT-QUANTITY

GOSS and DE LEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

Met-L-Chek visible penetrant dye for detecting defects in all metal, glass, and most plastic surfaces, is a water-washable, production-line inspection process for checking raw and finished work, carbide tools, dies, and ground surfaces. Available in quarts, gallons, drums; portable Flaw-Findr kits cost about $5. Dye covers 3000 sq ft per gal.

Met-L-Chek Co, 121 N Prairie Ave, Hawthorne, Calif

Edscorp stereo microscope is equipped with two sets of paired objectives, 3x and 5x, providing power range from 15x to 60x. Prism erecting system gives right-side-up image, correct as to left and right, for increased speed of assembly or examinations. Three sets of eyepieces furnished: 5, 8, and 12x. Instrument has rack and pinion focusing, is adjustable for extra height, maximum, 11 in. Base size, 5½x4 in. Price, $125.

Edmund Scientific Corp, 211 E Gloucester Pike, Barrington, NJ

Nobrush motor-generator unit is available to convert 60 cycles to 400 c. Compact, vertical, two-bearing converter requires minimum maintenance, has reduced heading. Outputs of 150 v-amp to 25 kva single or three phase are available with motor drive for any standard frequency or voltage.

Georator Corp, Manassas, Va

Tapping compound, called Tap Magic, is said to free stuck taps and reamers instantly, allowing continued rotation, eliminating tool breakage, and producing cleaner threads. In drilling and reaming, product is said to speed operation, produce a cleaner hole to more accurate tolerances, because gouging and scuffing are eliminated. Compound, which can be used on any metal, is non-flammable, non-explosive, and is said to be especially valuable in hand tapping and deep hole drilling.

Grether & Grether, PO Box 47, Stockton, Calif

Little Giant chip retriever removes chips from blind drill and tap holes on production lines, and in electrical and mechanical assembly work; can also be used to test coat of surfaces for magnetic properties of under material. Pocket-clip unit, mounted in case, is 6¼ in. long; model 15 is ¼-in.-dia, price $3.75; model 16 is ⅜-in.-dia, price $6.50.

General Scientific Equipment Co, 2700 W Huntingdon St, Philadelphia 32, Pa

ROUND TABLE Discussion

WHEN IS A TOOLMAKER

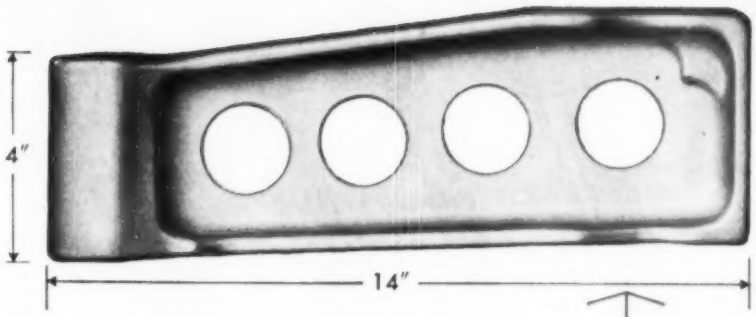
Is it justifiable to promote machinist to toolmaker if the man has never served a formal apprenticeship? If he proves equal to the job, shouldn't his lack of apprenticeship be overlooked in favor of ability?

I DON'T KNOW whether any attempt ever has been made to define the status of a toolmaker. To help solve the problem who was right or wrong —Al or Ed, in their discussion on what constitutes a toolmaker, I tried to look the word up in Encyclopedia Britannica, but I didn't find any definition. Then I turned to Tool Engineers Handbook, but no explanation is given there either. I also consulted Jones Machine Shop Training Course, Webster's Collegiate Dictionary, and several handbooks I have, but nowhere did I get an answer. So evidently a discussion of the present subject is more than justified.

A definition of a tool is given thus: (1) An instrument of manual operation as a hammer, saw, plane, file, etc, used to facilitate mechanical operations; an implement. (2) Any instrument or apparatus necessary to a person in the efficient prosecution of his trade or calling. (3) The cutting or shaping part in a machine; also, a machine for shaping metal.

A toolmaker should then perhaps be a guy who is able to make such tools. But anyone who has machine shop experience knows that a definition of that kind would be much too wide. No toolmaker, however skilled or whatever apprenticeship he has served, is able to do that. A man is named a toolmaker even if he can make only a few types of the tools he or his fellow workers are using, or perform skillfully only some of the operations involved in making tools in general. Apprenticeship at its best is also only a foundation on which future knowledge of the trade should be built.

Considering the shortage of toolmakers and the neglect of organizing training programs in the trade, I think it is absolutely necessary to open all channels for men to enter the toolmaking field. By doing so, many boys with an inclination for making tools who never had the privilege of serving their apprenticeship will get a chance to work in a



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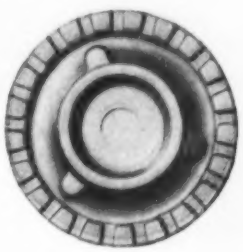
MUELLER BRASS CO.
Aluminum Forgings Save Weight, Save Finishing Time and Provide the Same Strength as Steel

If weight and strength are important factors in your product, then Mueller Brass Co. forged aluminum parts may be your best bet. Mueller aluminum forgings weigh only ⅓ as much as steel, yet they are approximately as strong. They make ideal parts for many applications and they are particularly desirable as parts for high speed rotating and oscillating machines because they reduce vibration and bearing loads, thus causing less wear on other parts. They possess good dimensional stability and retain their mechanical properties at high speeds and reasonable temperatures. The smooth, bright surfaces save machining time and eliminate costly finishing. Mueller Brass Co. can forge aluminum parts to your specifications in any practical size and shape from any of the standard or special alloys. Write us today for complete information.



MUELLER BRASS CO.
PORT HURON 23, MICHIGAN

PRECISION MACHINE GROUND-FROM-THE-SOLID

Consistent Exellent Performance — Unusual Economy and Ultra Precision work has firmly established Jarvis Solid Tungsten Carbide Tools among users who know quality.

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THE CHARLES L. JARVIS CO., MIDDLETOWN IN CONNECTICUT

trade they like and in which they might be more useful than if employed in some other kind of work. It is also true that many young fellows, who served their apprenticeship, will never be good toolmakers because they haven't got the right kind of a brain for such jobs.

Al is therefore perfectly justified in promoting Judson to a toolmaker's job, even if some of the guys in the toolroom kick about it. And what promotion isn't complained about by someone?

I don't believe Ed is telling the truth when he claims that the boys in the toolroom are sore because Al has transferred Judson to a toolmaker's job. This will never happen if men who can be matched against any of the toolroom guys any time are made toolmakers. And if they can do their tasks in the toolroom as well as anyone else, they deserve their toolmaker's rate too, of course. I wonder if Ed isn't quite a stranger among the men in his own machine shop? Why should they be jealous if a man is advanced? Don't they all have that desire? Certainly! If Judson is a clever machinist his fellow toolroom workers will accept him and make no trouble because he was given a better job. They won't go on strike either. It would be quite different if Judson was unjustifiably favored.

Al acted in favor of his company when he prevented Judson from leaving. I think too he'll be a good asset to his employer as a toolmaker. The insinuation by Ed that Al is looking for favors from the future president of the company is an unworthy jibe by a foreman in any civilized country. Ed's griping about this man's promotion should be taken for what it is worth—nothing.

A E Fristedt
Stockholm-Bromma, Sweden

"He wasn't too good on the controls until I got this idea from looking into his background."

POWERFUL
FLEXIBLE SHAFT MACHINES

AN INDUSTRIAL MACHINE FOR INDUSTRIAL USERS

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Jarvis POWER TOOLS

THE CHARLES L. JARVIS CO.
MIDDLETOWN IN CONNECTICUT

+GF+ Work Drivers

Revolutionary new time and energy saver replaces work dogs on centered lathe work

—SAFER—FASTER—

Work Driver with hood removed

Skinner is proud to announce its appointment as exclusive distributor for the George Fischer line of patented lathe work drivers. The +GF+ consists of 3 eccentric jaws (6 on largest size) which have floating spring action to accommodate smooth or rough bars and forgings. A smooth protective hood covers all mechanism, and also acts as a manual opening and closing device for the jaws. A slight turn of this hood opens the jaws, and holds them open, until work is placed between centers—another turn releases the jaws to grip the work. Any increase in tool pressure and spindle speed automatically increases the holding power of the +GF+. Jaws are easily reversed to accommodate direction of spindle rotation. Skinner carries a complete stock of +GF+ drivers and replacement parts.

Write Skinner or your nearest Skinner distributor for new illustrated folder giving complete details!

NOTE WIDE RANGES!

Type 36 — 1/2" to 1-7/16"
Type 60 — 5/8" to 2-3/8"
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Type 200 — 4-7/8" to 8-1/16"

THE SKINNER CHUCK COMPANY

203 Edgewood Ave., New Britain, Connecticut

Turn hood out of index position — Turn work piece against jaws

Turn work piece away from jaws — Turn hood until index snaps in

Sold by leading distributors in every industrial area

JUST WHAT IS THE DIFFERENCE between an all-round machinist and a first-class toolmaker? We can look upon an all-round machinist as a strong-armed artisan who has served his time in some kind of a machine shop, struggled his way through a correspondence course, or had aggressiveness enough to study in his evenings, and through dint of effort changed his jobs around the country so as to get more experience.

Perchance the guy works in overalls and, now that he has reached his zenith in skill, likes to mingle at the brass rail of fellowship and cogitate over some difficult job that he has to tackle on the morrow. He usually doesn't worry his boss over some piddling detail, as do some of our "on-the-moneyers" bedecked in starched aprons; he carries on his work according to the wisdom of his mature knowledge.

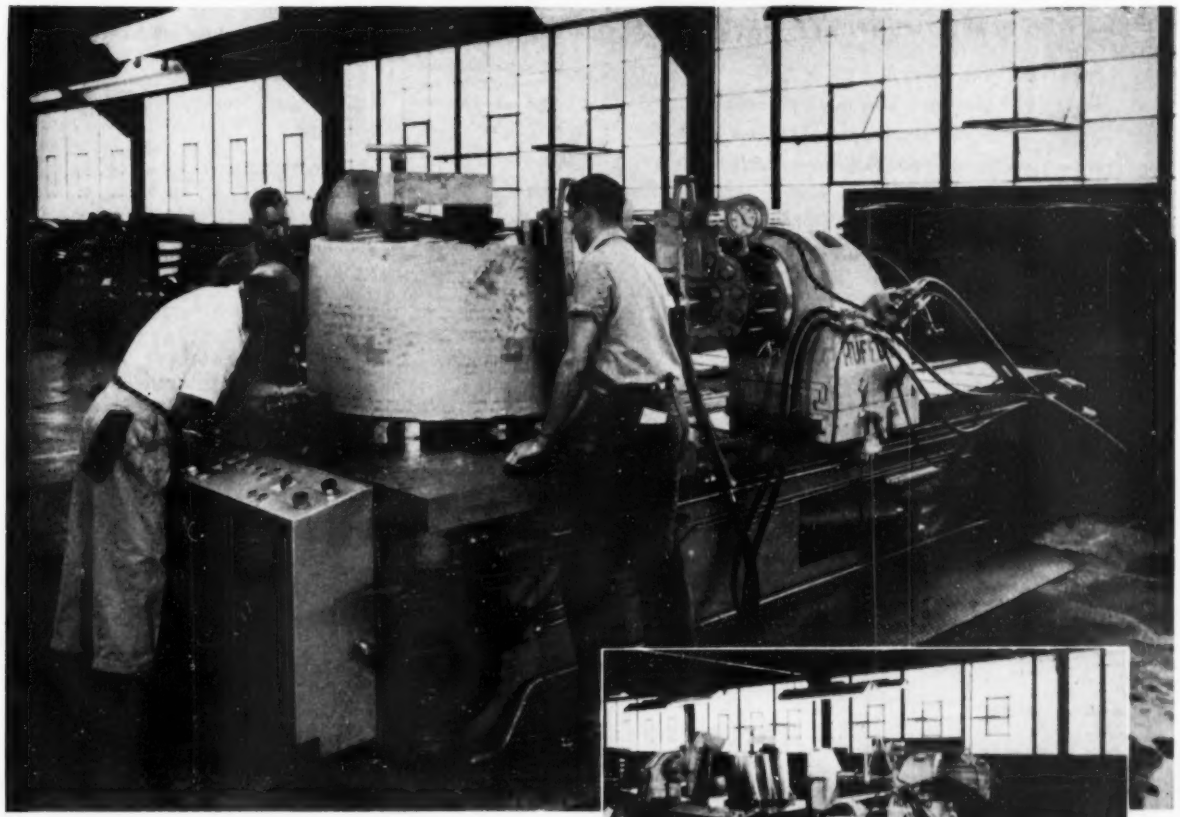
I mention the all-round machinist to differentiate between the specialized machinist, such as lathe hand, shaper hand, drillpress hand, boring mill hand, slotter hand, planer hand, and floor hand who, in themselves, are not to be disparaged in any way because they have found their niche and are happy. These chaps are a credit to their trade and fit in with our method of production. The all-around machinist is one who possesses the admirable qualifications of all these, plus the ability to handle most any job on the floor. Specialization is putting the squeeze on the all-around man, except in small establishments.

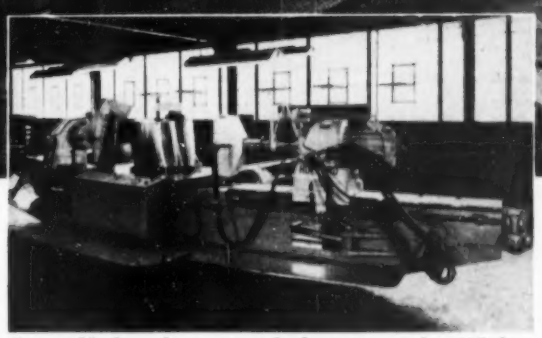
This valuable employee possesses the qualifications necessary to one who enters the so-called, higher bracket—toolmaking. As an all-around machinist, he isn't called upon to calculate with the degree of accuracy as is the more advanced man. He has, however, acquired the science of measurements (I suppose

"JB is in for a let-down. Someone put 3 zeros too many in this tonnage production report."

Simple Model A-12 Conversion

Does the work of TWO Machines!





Raising blocks under tension cylinders accommodate 30" sheet jaws; increase sheet width capacity 50%. Machine still retains original efficiency on small extrusion forming.

1. Stretch-wrap forms *all small extrusions!*

2. Handles sheet widths *up to 30"!*

3. Saves an *extra* machine installation!

Arnolt Corporation, Indianapolis Division, was faced with a puzzling problem: how to handle their wide range of subcontract forming on a single, between-size machine. Tooling—already developed for another type press—had to be utilized without alteration.

This Hufford Model A-12 conversion did the trick, covering an unusually wide scope of operations. Sheet capacity has been increased 50%—from 20" to 30" widths—by special raising blocks beneath tension cylinder brackets. At the same time, the machine still handles all small extrusion forming jobs normally put on a Model A-10. The conversion is rated at 50 tons capacity and is successfully doing jobs usually requiring both a larger and smaller machine. The user reports complete satisfaction with this A-12 modification, turning out excellent production with better-than-ever quality.

Perhaps one of the many Hufford machines or a similar adaptation to the above will help solve your forming problems. We'll be glad to make suggestions.

HUFFORD
Machine Works Inc.
EL SEGUNDO, CALIFORNIA
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Shaved Semi-hardened Helical Gear for High-speed Blower

Since 1907 The Cincinnati Gear Company has been producing quality gears, custom made to exacting specifications by expert craftsmen. Through these many decades of faithful and consistent service to industry, Cincinnati Gear has earned an enviable reputation—a reputation as a firm in which you can have complete confidence. This reputation is your assurance of complete satisfaction with every gear.

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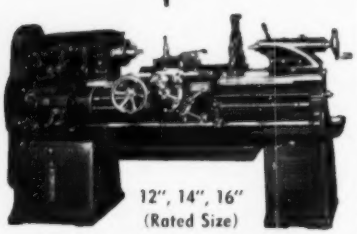
***Metalmaster* LATHES**



12", 14", 16" (Rated Size)

Engine and Toolroom Lathes

BRADFORD Metalmaster Geared Head Lathes have earned an enviable reputation throughout the years for high efficiency and dependable accuracy. But today's new Metalmaster is even finer! Built to the most exacting standards of workmanship, and of the finest materials and components, these new Metalmaster Lathes are equipped with many outstanding features.

POWER for Your Job: 2 HP to 10 HP

SPEEDS for Your Job: 16 RPM min. to 1000 RPM max.

FEED: 72—.00072 to .1780

THREAD RANGE: 1½ to 368, including 11½ and 27 without extra gearing

• ***Let our Engineers solve your lathe problems.***

Write for Bulletin 179

THE BRADFORD MACHINE TOOL CO.

664 Evans St., Cincinnati, Ohio

Precision Since 1840

DELIVERIES:

30 days, subject to prior sale

we can refer to it as a science) by years of practice. He wields a wicked caliper. He is able to tackle a job of gigantic proportions and then, without batting an eye, take on a small job with equal facility. He'll be as at home at a job in which he will have to wear dirty overalls as he will be in doing a fine job on the bench. Truly no man, or organization, could have any objections to such a man being advanced to the job of toolmaking.

With all his precision gadgets, where would the "on-the-money" dude get were he suddenly confronted with a job turned out with such facility and speed as our versatile, all-around machinist? I'm not belittling the modern toolmaker by any means, as he is likewise a credit to the manufacturing science. What I want to stress is that the all-rounder is no slouch, and deserves his chance to undertake the better work which he will be able to do if given the proper chance—bellyache or no bellyache.

I'd like to inject a little information right here which throws some light on the subject at hand. Some years back a rural type of an individual presented himself at the back door of our shop. He repeatedly inquired if there was any chance of getting on, and when the boss of the outfit finally took an interest in him he took him in with the understanding that if he didn't show definite potential value he would be canned. It couldn't be seen that the fellow was ingenious until he was put to work; in a few years he turned out to be a good man able to adapt himself to any job that came up. He has since gone forward and now holds a shop executive position somewhere in the northwest.

Contrast this with another chap

"Of course, you're worth more than Smith here—but you have to take into consideration that he's my son."

who applied for work with abundant claims as to his ability. This man had worked in the toolroom of an aircraft factory—his toolbox was loaded with drillrod of various sizes. He'd fiddle around with a job, ask questions perpetually as to how to proceed, and finally, when the job was finished it looked like something that had been prepared for presentation to some royal peer. The boys tagged him as old "On-the-money," but in reality it was "Squander the money" as everything he touched had to have the finish of a Hamilton watch. To stretch my point a little bit, why does the base of a lamp post have to be spotfaced?

The machinist may not be hep to super-finishes, but his experience tells him where to put the time on a finish to meet a certain condition, and you can bet your Aunt Katie that after he cleans his fingernails and puts on a pair of creased trousers that he will soon take his place with the best of the so-called gentlemen of the trade. An all-around machinist is a diamond in the rough, and with a little polishing he'll sparkle with the rest along the white-aproned gentlemen's row.

Frank Van Horn
Auburn, Calif

A TOOLMAKER IS A TOOLMAKER when he can make tools. A machinist who through empirical knowledge has developed his talents to the extent that he can do a toolmaker's work is entitled to the opportunity to do so. Under both the natural economic law and the divine moral law, free enterprisers have an obligation to use a man's talents to their highest degree. Labor unions also have such an obligation. Thus it is fair to upgrade a talented machinist to toolmaker.

The workingman is a creature created by God. He has a moral obligation to make the fullest use of his talents. Economic necessity may also require him to do so. When a workingman meets this obligation, an opportunity should be created for its fulfilment. The creation of such an opportunity is an example of both Christian charity and economic enterprise. Employers and union leaders often fail to show such an example. Answers such as, "You have the right training, but it's on the wrong paper," and "You have the ability, but not the company service," are examples of man's inhumanity to man.

Free enterprise is alleged to be weak in its respect for human dignity. It is alleged to make a machine

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THESE bronze bars have many uses, particularly where their free machining properties are important. Many manufacturers find Johnson Universal Bronze ideal for certain gears and pinions, guide rollers, sheaves, trolley wheels, tips for air tools, washers, thrust plates, as well as for bushings and bearings. The cost per pound is offset many times by the low cost of machining. Non-sparking properties and corrosion resistance recommend it for certain uses. Another big advantage is that Johnson Universal Bronze is available from distributors' stocks, fully machined, in solid bars $\frac{5}{8}$" to 8" diameters and in cored bars from $\frac{1}{2}$" to $7\frac{3}{4}$" inside diameters—in all, over 400 sizes. Also available in hexagon bars from $\frac{5}{8}$" to 3" outside diameters. Each bar is usable from end to end, no waste.

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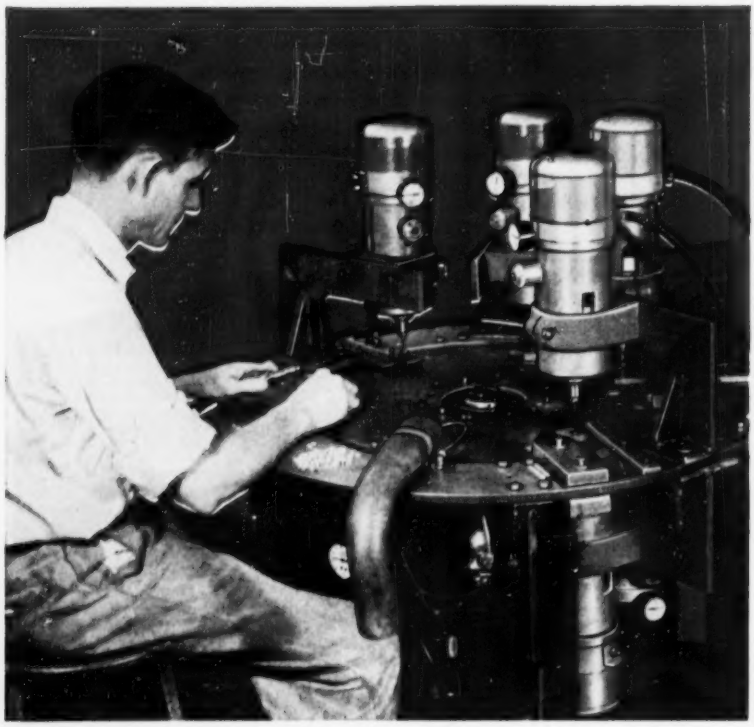
Sleeve Type

Why buy expensive tooling

...when Dumore Drill Heads will mass produce small holes *at a fraction of the cost!*



This setup consists of six Dumores — mounted four above and two below an indexing table. It solved the problem of production drilling and chamfering two holes (.038" and .076") in a tiny (.109") brass part.

NOW, with Dumore Automatic Drill Heads, you can put small hole drilling on a profitable mass production basis without making a major investment!

Low-cost Dumore Automatic Heads mount in any position ... are easily set up to handle practically every small hole drilling operation. They make it simple to drill multiple holes in a single workpiece in only one operation . . . are equally efficient as components of multiple station high-production machines.

Why? Because these compact, 17½-lb. precision tools are self-contained . . . require no expensive air or hydraulic lines . . . have built-in automatic controls.

However, outstanding productivity and flexibility are not the only advantages Dumore Drill Heads offer. They also give you substantial benefits that effect conservation of skilled labor . . . big reductions in drill breakage. So get all the facts now. Contact your Industrial Distributor or write:

DUMORE PRECISION TOOLS
The Dumore Company
1337 Seventeenth Street • Racine, Wisconsin

of that which God created in His own image and likeness. In the final analysis it will be respect for human dignity which will be the battle line on which free enterprise will rise or fall in its fight with communism, socialism, and fascism.

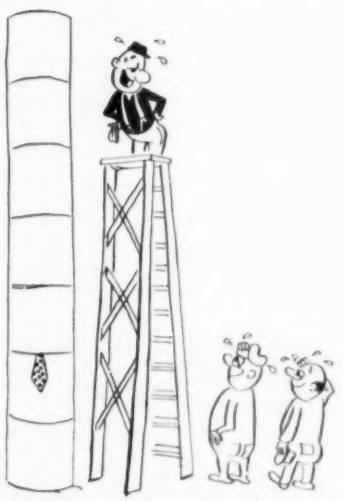
When Al promoted Judson from machinist to toolmaker he was promulgating the truths men live by. He was acting like a Christian should act. Free enterprise needs men like Al.

Al's action shows him to be a man of courage and vision. He is not afraid of an immediate fight to gain a mediate victory.

Some toolmakers and a few labor agitators will stir up trouble when a capable machinist is promoted to toolmaker. However, most of the toolmakers will realize how important they must be when a man of Judson's caliber aspires to their craft. Toolmakers are usually square shooters with a sense of fair play. Al's case has been effectively presented. Since there are strong principles behind Al's judgment, the toolmakers should abide by it.

It is doubtful if any union trouble will arise from this move. Many union leaders know what a toolmaker really wants out of life. He wants to do creative work, work he understands, work from which he receives a feeling of accomplishment. He wants to feel important, appreciated. When men develop their talents to do better work they should be appreciated—like Al appreciates Judson. Such appreciation will eliminate a bottleneck of skilled labor. Al knows a good man when he sees one. We need more bosses like Al.

Peter A Seward
Swampscott, Mass



"Thank goodness we got these forging rings stacked . . . say, where'd the boss go?"

In 1943, World War II was at its peak and skilled labor was just not to be had. I was in the position of shop superintendent of a small shop. Upper management made the mistake of following a policy of grab; orders were accepted with little hope of more than a small portion being completed by promised date. A steady run of expediters beat on our door. I know—I had the unpleasant task of concocting excuses for the delays. With such a situation it was inevitable that something had to bend. And it did. Upper management was fired. This left another fellow and myself right squarely in the middle of all obligations.

We were faced with the prospect of begging off from our commitments or training men in a hurry. We chose the latter. Most of our orders were for dies, jigs, fixtures and gages. The existing toolroom consisted of one first class toolmaker and fourteen other men ranging from former auto mechanics to transferred silverware spinners.

Most of the men who were skilled in other trades had at least a general knowledge of the operation of one or more toolroom machines. We concentrated on furthering the training of the men on the machines they were most familiar with. In this manner our potential toolmakers became proficient with at least one piece of equipment rapidly.

One of the greatest difficulties for some of the men was to understand blueprints. I would sit down with a man for two hours to explain, if necessary. I would choose certain details from a drawing and make isometric sketches until I was sure he knew just what was required. As we proceeded, I would prod him for suggestions on the best approach to machining these details. In the course of time we would have the method mapped out, including the number of hours. When the details were finished machined, we would repeat the process until the job was completed.

In most toolmaking jobs there are only two or three really crucial steps where the years of experience enter. When the crucial moment arrived, I made it a point of being around to help.

All of our jobs were placed with the men on a bonus system. Even the quality had an incentive attached to it. A pair of micrometers, a depth gage, a set of "V" blocks or some common shop tool was given away. These were prizes for the best tool of the month—appearance-wise and inspection-wise. Then a photograph of the tool was made and displayed.

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It may sound incredible, but in six months time we had cleaned up all of our old obligations and were doing some of the most meticulous work in our area. We purchased some fine measuring equipment and got right down to precision work.

Most of the "quick-trained toolmakers" continued working at their newly-found trade. Two went into business for themselves.

Wouldn't you be inclined to agree that results like these made the training investment worthwhile?

Perhaps James F Lincoln summed it up best when he said, "All men would be geniuses if they should develop to the extent they can. All men would be incompetents if they developed their latent ablities not at all."

Harold C May
New Britain, Conn

CERTAINLY A GOOD all-around machinist can be advanced to toolmaking and nine times out of ten, if the guy has the will to get ahead, will make a fine adddition to the toolroom.

You'll find thousands of the best toolmakers have had the groundwork of general machine work and through diligent study and observation have made good on the job. They have served their time in acquiring the basic fundamentals of the trade and following their apprenticeship traveled around considerably to gain invaluable experience. They may appear unfit to handle toolmaking by some of the finish they put on work, but don't be mistaken; they know where finish is required and where good enough is sufficient for the job.

The trouble with Ed is that he is of the opinion that any operator, who until recently has been thought of as a mechanic, has not had the necessary training in fundamentals to fit him for the more advanced

work. Ed shouldn't confuse an operator with an all-around machinist who can tear down any machine and rebuild it to working perfection.

It is true that Judson may be used to overalls instead of clean apron, but you'll find that an overall-clad machinist has it all over a great many so-called toolmakers who take particular pride in their spotless aprons and carefully creased trousers. There is a decided difference in the class of work done by the good machinist and the so-called Mike hound who makes a practice of wiping his hands periodically with a piece of clean waste or specially provided cloth. You'll find a difference in the condition of their nails as well as the toughness of their hands. The machinist is used to a rougher class of work, but he is well fitted to adapt himself to the work usually done by the toolmaker. The machinist has acquired the sense of feel so necessary to both jobs.

Obviously the expert machinist cannot jump in and do the work of a toolmaker immediately without having a period of time to take over. You can bet your crimson toupee that he's potential material for the job and will, in a very short time, earns his stripes as a workman who will be a valuable addition to any toolroom.

It shows a mark of wisdom on Al's part to promote Judson to the toolroom rather than run the risk of the company losing him. I cannot see where there could be any gripe coming from the toolmakers any more than there should be any complaints coming from the tool designers because a toolmaker was advanced to the job of tool designing. You wouldn't expect a toolmaker to fit himself into harness right away any more than you would expect a machinist to fit in as a toolmaker without little fundamental training.

I'm not talking through my hat as I went through these two transitions: machinist to toolmaking and to tool designing. It was the experience and training I had as a machinist that influenced the toolroom foreman to recommend me to the head of the tool designing department. I made good in both switches because the experience I acquired in the one fitted me to take over in the other.

I feel that Ed is talking through his hat when he says that Judson isn't qualified because he hasn't served his apprenticeship in toolmaking. Any machinist—now I don't mean the modern understanding of what a machinist is—any machinist who has served his time and acquired

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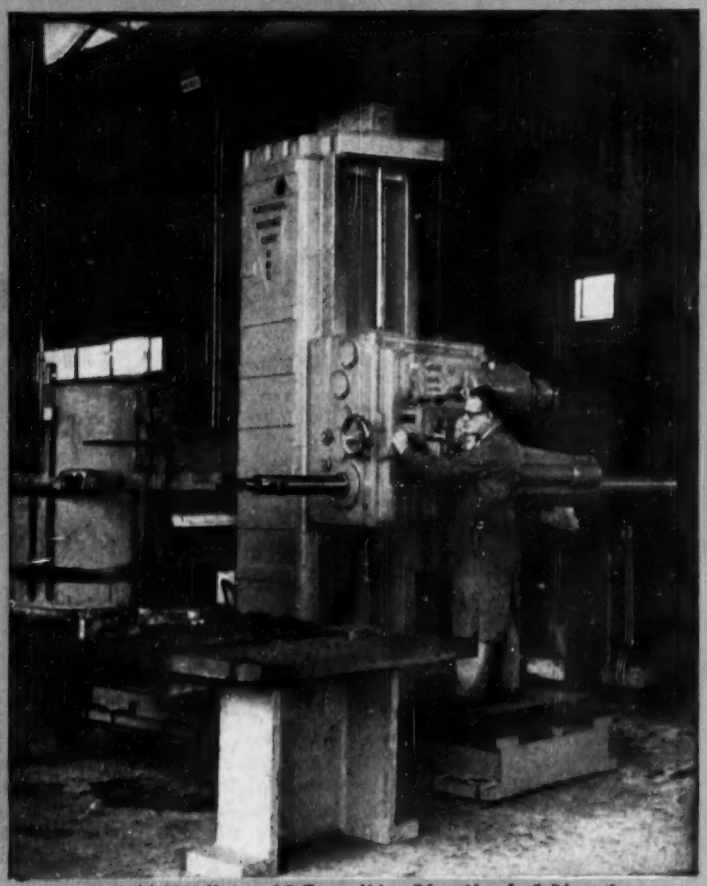

Model 3040 Horizontal Drill—machining all four sides of rail slide casting.

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. . . drive boring fixtures and perform drilling, reaming, boring, counterboring, tapping and spotfacing operations on any size or shape from small production parts to large unwieldy workpieces.

Model 3040 is a sturdy rugged horizontal drilling machine with 10 HP, 15HP or 20HP spindle motor and unusual column rigidity. Maximum productivity assured by use of highest feeds and speeds permissible with modern cutting tools.

Other horizontal models have tilting head or horizontal head and 360° column swivel. Universal models with compound head swivel permit angular, radial and horizontal machining operations with one setup. Machines designed for both portable and stationary applications. Extended runway travel and column height available on all models. Special adaptations to handle your machining problems.

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Model 125-HR Horizontal Drill—used with revolving table to drill and tap tractor frames.

Model 1030 Horizontal Drill—performing drilling, tapping and boring operations on milling machine column.

Special Model 140-U with extended column, runway, and reach—for drilling Diesel Engine bases and blocks.

KMC

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KAUKAUNA, WISCONSIN, U. S. A.

additional experience through travel and switching jobs when he feels that he has absorbed all he could at a place, is certainly well qualified to step into his place as a good toolmaker if he is mentally alert to acquire additional information through many volumes of technical information.

Like anything else, a man can make as much progress as his will dictates. The fact that one is a good machinist is no assurance that he will make headway when entering the toolmaking profession unless he sacrifices many hours of his evenings picking up necessary information which he could not acquire except through many years of application.

J Homewood
Tujunga, Calif

•

PORTIONING OUT THE PIE

How can one worker be paid more than the other men if he is doing additional jobs for the foreman? Is a shop-wide job evaluation system the solution to this problem?

PORTIONING OUT THE PIE might sometimes be quite difficult, but in the present case it seems easy. If Bill Hanson is worth more dough than the other guys and Al can't pay him more because he is not authorized to pay anybody above a certain amount, he must find some other means to satisfy Hanson's demands.

I wouldn't let him go when he's considered more valuable than the others without trying to keep him by compensating him more in one way or the other.

Ed's suggestion that Al can't let one man get ahead of the others, even if he is worth more, is, of course, wrong. This very thing is done every day everywhere. I have several per-

"Somewhere my wife got the idea Congress had cut taxes and she went out and spent the difference on bigger Christmas gifts . . ."

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sonal experiences along these lines to prove that Ed is mistaken on that point. In any group of men there is as a rule somebody with more outstanding ability than the others. Why shouldn't he be payed accordingly?

While I worked in Boston as a machinist in a small shop, one of the fellows was admittedly better than many of the others. In order to keep him, the big boss ruled that he be paid more than the rest of us and placed in the testing room by himself to do a certain kind of adjusting job that was difficult. Also, he didn't have to report to our foreman, but to the superintendent. No one in the crew had any complaints to make about the arrangement.

There are many ways of evaluating jobs. While I worked in Cleveland as a tool designer many years ago I had occasion to practice a system of job evaluation. Each design of fixture or die was rated in advance by a straw-boss, and the designer concerned to so many hours, according to a progressive scale starting with 4 hours, and increasing by 50% each step such as 6, 9, 13, hours, etc. A bonus was paid in addition to the regular pay on each job if the time used was less than the period agreed upon. It had a very stimulating effect on the whole force. But that, of course, didn't favor any particular man, as is the purpose of this case.

In turning out a specialized product it is easy enough to rate each task to a certain wage, or put the guys on piecework. When manufacturing a mixed product, however, it's much more difficult. While it is possible to pay a fixed rate for each machine, it is almost impossible to evaluate bench work and other similar work properly. So, if Hanson is regularly running a machine that

"And Haverhill, you operate the bantam tumblers . . ."

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PERMANENT
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An entirely new design, the Taft-Peirce Superpower Permanent Magnet Chuck has 15 to 20% less height than other makes. Provides more clearance between wheel and chuck.

Stronger, yet flexible, too. Just push or pull lever to vary power anywhere from maximum to minimum. Permanently magnetized, power won't fade with use.

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Ideal for surface grinders, these T-P Chucks are also effective on light millers, planers, shapers. The portable smaller sizes speed hand-finishing, burring, scraping, polishing, inspection operations.

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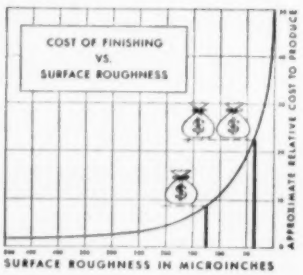
Surface finish control can reduce *your* machining costs

PROPER surface finish control may well yield big savings in your plant by reducing production costs, increasing production rates, and improving product performance.



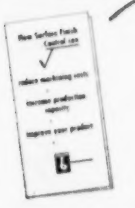
The chart shows how finishing affects the cost of machined parts. For example, if the surface finish is specified as 125 microinches and you are overfinishing to 32 microinches because of lack of proper gaging equipment, your finishing cost can be twice as much as necessary. To eliminate costly overfinishing, actual checks of machined surfaces should be made in the shop to be sure that specified values are met *but not exceeded.*

With surface finish control you can eliminate unnecessary operations and operate more efficiently. It helps you improve your products, since surface finish affects many factors in performance, such as break-in time, wear, heat transfer, lubrication, etc.

A new method of Surface Finish Control

THERE is now a simple method of measuring surface roughness on the production line so that the benefits of surface finish control can be realized. The Brush SURFINDICATOR* is a portable inspection tool . . . easy-to-use . . . accurate. This new instrument makes surface roughness measurement a practical shop operation.

*Trade Mark



Get the complete story—get your copy of this new booklet on Surface Finish Control. It offers you the key to reduced machining costs, more efficient use of equipment, and improved products. Write Brush Electronics Company, Dept. U-12, 3405 Perkins Avenue, Cleveland 14, Ohio.

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might be rated, there would certainly be a lot of red tape involved to evaluate his breaking in the new help, if this is to be rated higher than his regular work. I don't think Hanson would be satisfied with Al's suggestion to slip in some extra dough for him when training new men. It would be too irregular in its effect.

Evaluating each job at the bench or machine would certainly invite trouble unless Al was very liberal in his evaluation. No man would accept his evaluation unless it proved it would be easier for him to make the same wages as before. But this would lower the efficiency of his department, so Al should not try to solve his problem that way. Nor should he let Hanson go.

Why not suggest to the big boss to appoint Hanson assistant foreman, or Al could tell him he would recommend him to that advancement when occasion arises. Hanson could also be payed on a salary basis. I don't think anybody would object. If anybody kicked about it, it would be fairer to let that man go.

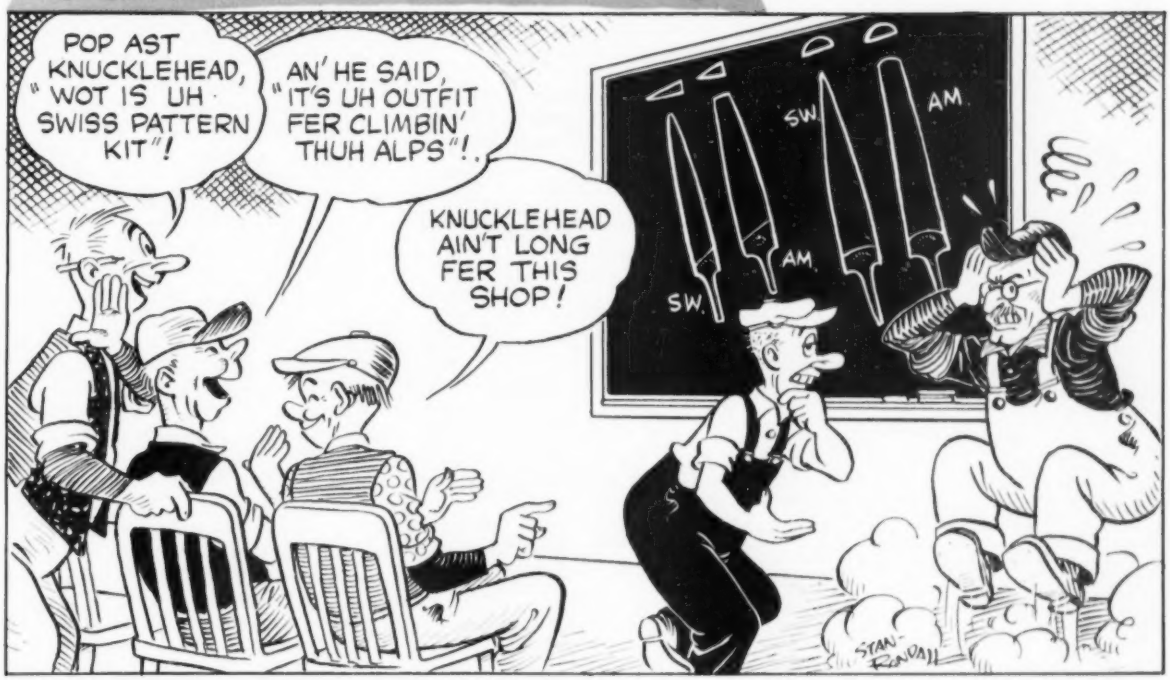
A E Fristedt
Stockholm-Bromma, Sweden

IS BILL HANSON worth more money because he is always given the job of breaking in trainees? Why definitely he is worth more money, and it should be given him, but not by job evaluation.

Job evaluation is for the birds and the duckbilled platypusses. That term is just another synonym for regimentation, and regimentation is for the Hitlers, Mussolinis, Stalins, and other dictators. Under unionism, job evaluation is almost a necessity; the unions want it, like it, and their treasuries thrive under it, but it's not for me. Job evaluation is one of

"Don't worry, if I get in any trouble, I'll ring!"

POP'S school of filing



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Because of their *extra fine* quality and workmanship, Nicholson Swiss Patterns are appropriately trademarked X.F. They are the handicraft of specially trained file cutters working in a separate section of the Nicholson factory.

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A 10", 11" or 12" Sheldon Precision Lathe can work to the closest tolerances and hold its accuracy because it has "Zero Precision" Tapered Roller Bearings. It can operate at a wide range of speeds, has an efficient underneath drive (4 speeds open belt, 4 speeds through back gears). Its double V-belts to the spindle will deliver enough sustained power to take really heavy cuts with high speed "open belt" operation. It will cut from 4 to 224 threads per inch with the shift of two tumblers on its full quick change gear box (54 different pitches including 27 t.p.i.). It will provide big lathe collet capacity—a 1⅜" hole through the spindle.

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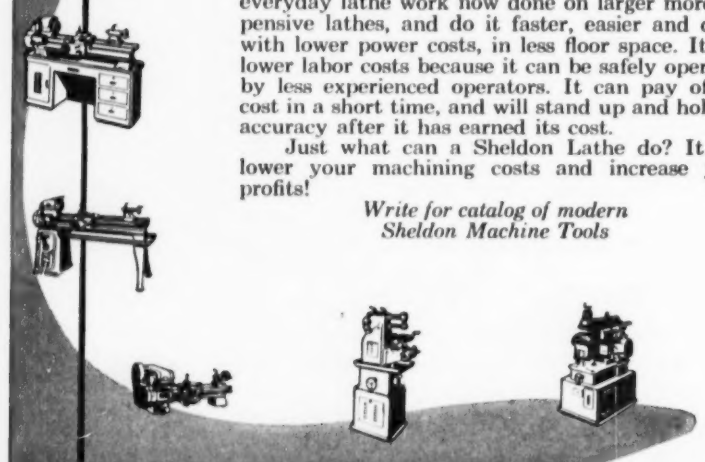
Just what can a Sheldon Lathe do? It can lower your machining costs and increase your profits!

Write for catalog of modern Sheldon Machine Tools



SHELDON MACHINE CO., INC. 4234 N. KNOX AVE. CHICAGO 41, ILLINOIS

the tools by which a few good men are used to raise the pay and status of a mob of unskilled, semi-skilled and poorly equipped workers who are satisfied to drift with life's current.

As opposed to job evaluation, I am strongly in favor of manpower classification — of evaluating men and paying them what they are worth, rewarding the diligent, the creative, and the careful for their individual contributions to a company's efforts. Under unionism, this is not permitted. Now I am not opposed to unionism as a whole, but just to some of its practices. I am opposed to exploitation of any group of people or workers, and so is unionism. However, unions do not hesitate to exploit the few good men in any shop in order to raise the pay of a great mass of indifferently-equipped workers. I don't care for that principle.

There are times when job evaluation can be used as a tool to right unjust inequalities. Such a case occurred a few years back when I was managing, among others, a group of 126 toolmakers. There were just two men in that group whose particular abilities as skilled craftsmen made them outstanding in that shop in any man's language. I wanted to raise their pay, so I called in the union representatives and explained my reasons and asked for their approval. They were quite agreeable.

"Yes," they said, "you can raise their pay—if you raise everybody else's pay to the same rate."

That, of course, was impossible. My superiors wouldn't have stood for it, even if I had proposed it. So two of my subordinates and myself sat down and pooled our knowledge of every one of those 126 men. We knew what training they had had, what work they could do, and what work they couldn't do. We graded and classified

"Just a minute—what happened to the sandwich I laid here?"

each man by his ability. We graded the type of work they could do into seven different classes. We then announced to the union that we were evaluating our particular brand of tool work into seven different classes, and that we were setting up seven different jobs each of which would carry a certain rate of pay. As individual men increased their skill or raised their proficiency, we proposed to promote them into higher grades.

The idea met with some resistance, but it was finally agreed to. We then wrote our seven different job descriptions and announced our rates and gradings officially and publicly. The two men I was particularly interested in were placed in grade number one and received top rates. Apparently and officially this was a job of job evaluation, but actually it was a case of classification of men—and there is a difference.

The US Government Civil Service is a very fine illustration of the negative and abortive effects of job evaluation. Right-thinking men created the system, and in an honest effort to be fair, they decided to evaluate each job, and pay men on the basis of the skill required to handle each job. Now on paper that seems eminently fair, but let's see how it works out.

I have in front of me one of the Civil Service writeups for the grade of Engineer. It reads in part:

ENGINEER

GENERAL REQUIREMENTS:

(A) They must have completed successfully a standard professional engineering curriculum leading to a bachelor's degree in a college or university of recognized standing; or

(B) They must show that they had at least 4 years of successful and progressive technical engineering experience of such a nature as to enable them to perform successfully at the professional level. . . . The experience must show that the applicant possesses an understanding of this field of engineering blah, blah, and blah.

It's all double talk. If you have a friend in the right place, you can substitute two years' experience as a waterboy in a circus; plus two years' experience as a dinger in a garage as the equivalent of 4 years' progressive technical engineering experience, and, brother—you're IN.

I am in the government service and I am surrounded by a very likeable group of qualified engineers who wouldn't recognize a first-class high school if they were given a personally

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with "finger-tip" control

If the edge of a carbide tool is properly honed with diamond hand hones after regrinding with diamond wheels, the tool will give a production bonus of 20% more before regrinding.

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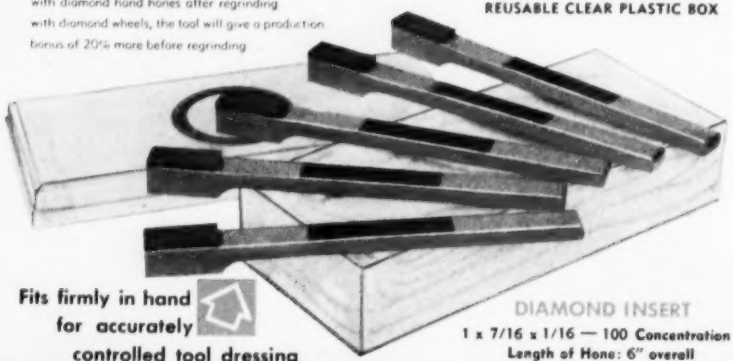

Fits firmly in hand for accurately controlled tool dressing

DIAMOND INSERT
1 x 7/16 x 1/16 — 100 Concentration
Length of Hone: 6" overall

for all general shop requirements

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DIAMOND GRIT SIZE

No.	SINGLE END		
1	100		
2	150	$7.50	In lots of 6 sets $5.00 off per set
3	220		
4	320		
5	400		

complete range for all tool cutter finishing

DOUBLE END.....

No.		DOUBLE END		
6	100	320		
7	150	320	$13.85	In lots of 6 sets $7.50 off per set
8	220	320		
9	400	320		
10	600	320		

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Scientifically controlled bonds perfected to do the best cutting job consistently, economically.

Send for catalog showing complete line of products

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US

conducted tour through the whole place.

As a graduate and working engineer, my job has undergone considerable evaluating down through the years. For several years, our evaluator, or analyst, was a woman. Was she an engineer, a chemist, a metallurgist, or a microbiologist? Uh-uh, but she had good connections. You know how it is in the Army; if Uncle Sam has 3 million dollars that needs watching, he can always find a reformed ex-bank-absconder to watch it.

Recently we've undergone an evaluation as was an evaluation. Our analyst was a right pert aggressive lad with a fixed determination to remake the world and he carried a BA degree in one of the arts. Of course, he wasn't anything in the technological line, but then, with the government, that's not necessary.

"Now just what do you do?" he demanded of me.

"Well, pal," I said, trying the friendly approach. "I create and write various test programs, direct the testing of various things, design special test equipment, develop new—"

"No! No! You're all wrong," he stated arrogantly. "Those things are all done in a higher echelon, and you can't do that. We're not organized that way."

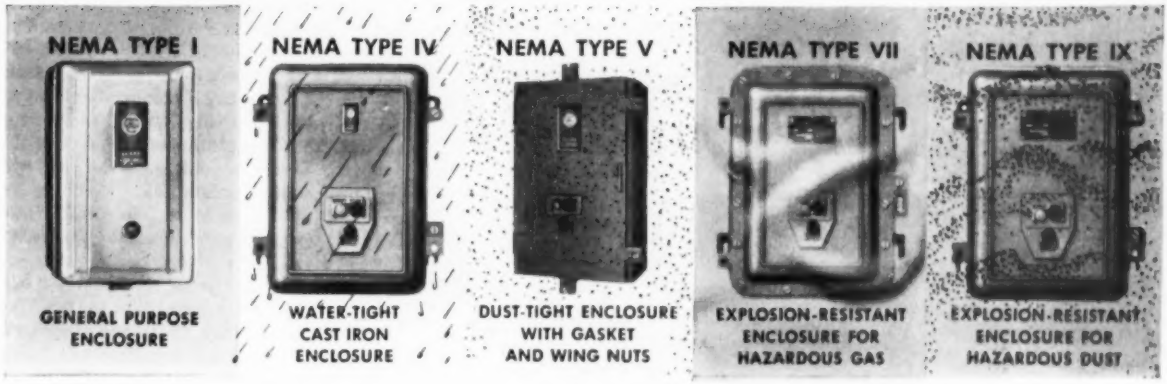
"I was just trying to tell you what I did," I said hopefully.

"Well, you're wrong. Now what you do is test, isn't it—just ordinary testing?"

"Not if I can help it," I stated. "But I'm considered good at development work—"

"That's impossible," he said in a horror-stricken voice. "Development work is done in the development de-

"—If you made better lunches, Pop wouldn't keep forgetting to take his to the shop!"



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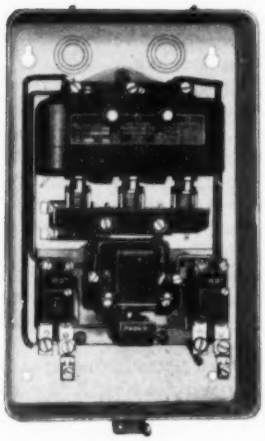
use CLARK TYPE "CY" STARTERS

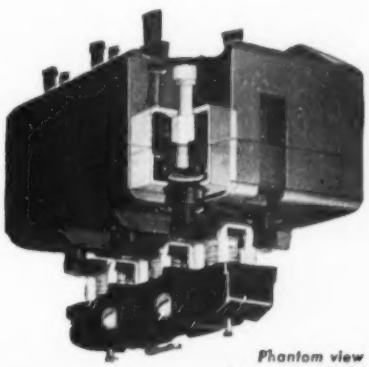


In every industry, including those where hazardous atmospheres prevail, CLARK TYPE "CY" STARTERS are giving utmost satisfactory service.

The incomparable new multi-turn magnetic blowouts combined with twin-break contacts, and the rest of the operating mechanism, are enclosed in types of cabinets to protect against adverse conditions or dangerous atmospheres.

Type "CY" starters, Sizes 2 and 3, employ an entirely new principle of arc interruption. The arc is extinguished by the effect of the blowout coil, concentric with the contact. The magnetic field quenches the arc either by lengthening or confining it. In its forced rotation it moves continually from a hot to a cold spot—minimizing burning or pitting of contacts. The ingenious design of the arc chamber prevents carbonization and the accumulation of hot gases between wiring terminals—minimizing phase-to-phase failures. Sizes 0 and 1 use the same general mill type construction as the larger sizes.

- **No filing, dressing or cleaning of contacts!**
- **No tools necessary to inspect contacts!**
- **Easy to change moving contacts!**
- **Stationary contacts changed quickly!**
- **Remove only two screws and one pin to change coils!**
- **Remove only four screws to take out stationary magnet frame!**
- **Power circuit contacts available with springs in complete packaged service kits for ease in stocking!**



Phantom view showing Arc-shield

***You'd better try* CLARK TYPE "CY"**

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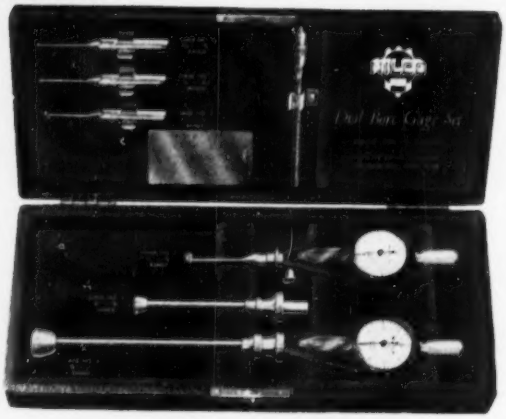
SAVE $250 on precision DIAL BORE GAGES



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Save on production costs! Operators using NILCO Dial Bore Gages see the condition of the holes and control the size right at the machine. Better parts and fewer rejects are the result.

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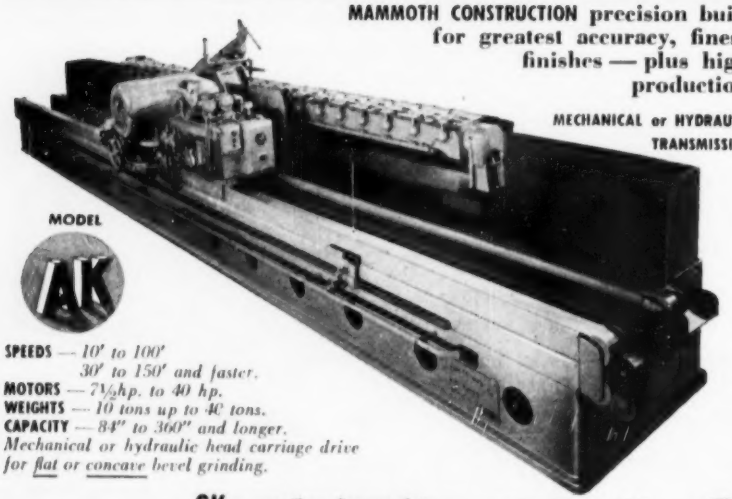

MODEL AK

SPEEDS — *10' to 100'*
30' to 150' and faster.
MOTORS — *7½hp. to 40 hp.*
WEIGHTS — *10 tons up to 40 tons.*
CAPACITY — *84" to 360" and longer.*
Mechanical or hydraulic head carriage drive for flat or concave bevel grinding.

Other Models. **GK — medium heavy duty** — *capacity 32" to 184"*
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partment, and that is a higher echelon. You're only supposed to test."

"Now just what am I to do," I complained, "when a development man sends something down here and says: 'We don't like this; it's no good. Come up with something else that will do four times as good a job at half the price—and quick.' Would that be testing?"

"All right, you test. Now what else do you do?"

"Improve products and components, and create new ones—"

"You can't do that!" he shrieked. "We're not organized that way."

I sorrowfully explained to him how he was organized, and now my report card isn't going to read A for that test. But that's government job evaluation at its best, done by incompetent nitwits, sired by nepotism, out of vote-getting expediency by rank favoritism and brotherly cliques.

So job evaluation isn't the answer for Bill Hanson. Analyze the functions he performs:

Lead Man
Trains new workers
Handles any job

and come up with a new job classification such as Assistant Foreman, Trainee Director. Appoint Bill to the job and pay him whatever you wish to. You are not evaluating all the jobs in the shop, but you are accomplishing your purpose—rewarding a deserving worker.

James K Matter
Detroit, Mich

THERE ARE MANY DIRECTIONS in which this skirmish may go and if Al's eye isn't strictly on the ball, he may, perhaps, wake up to the fact that he will have no more friends than a baseball umpire has with the home team losing.

The above brings to mind the story about Mr Comisky, of Chicago baseball fame, who was standing near the turnstiles when a gate-keeper spoke to him and said, "Mr Comisky,

"You mean to say . . . Granshaw . . . You would let your job come between you and an honest opinion . . . ?"

here is a man who asks to be passed in; he says he is an umpire with two friends." "Has two friends!" exclaimed Mr C, "Pass them in by all means."

From what Al says, Hanson is a specially good man, worthy of advancement, and deserves more money in the pay envelope. The matter appears to be one which could be solved, but it will require much in the way of diplomacy, and then some.

Probably in all shops there is more discussion among the employees about the different rates which men are paid than any other subject. Second to this is the amount of discussion among the employees about the different classes of work and who should perform them. Many times the employees think they know more about the work than their foreman or the brass.

As for job evaluation, as mentioned by Al, it is not necessary nor is it agreeable to many employees; in fact, many mechanics and other shop men who have worked where it has been in practice more or less, have pronounced it to be nothing short of piece work under another name.

It seems that if the right kind of diplomacy is used, Hanson could be transferred to other work, or to another location in the shop without anyone getting sore about it. If he is the high type of man Al thinks he is, and can do fine work and a reasonable amount of it, he is, apparently a thoroughly reliable kind of man. Because of this and the fact that he is capable of breaking in apprentices, or new men to whom a particular kind of work may be novel, he appears to be too valuable a man to lose, so Ed's advice to let him go is far from being the best.

It doesn't seem necessary for anyone except Al to know that Hanson

"Well, would it make you happier if we just treated you as an apprentice if we don't call you apprentice?"

For Unexpected Profits
IN YOUR SHOP

ask yourself these questions

- Could you increase your productivity and profits by *fast rearrangement of machines* to meet new production needs, with very little "down time"?
- Could you benefit by *speed in leveling certain machines?*
- In precision machining operations, such as grinding, do you ever find that rejects are *traceable to vibration?*
- Would you like to *forget about lagging machines* to the floor to keep them from walking?
- Would your worker productivity increase if you could *reduce plant noise?*

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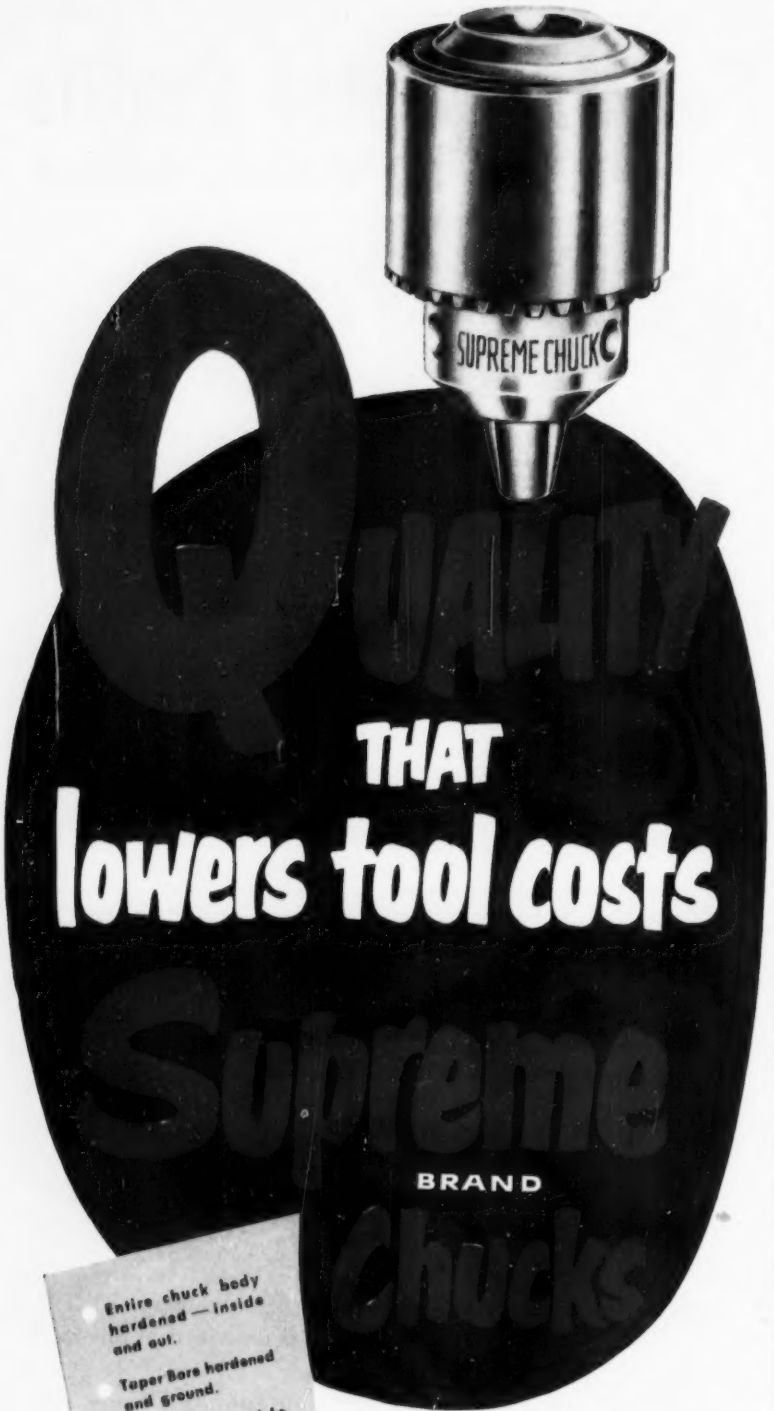

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is getting a promotion or more money. His location might be very quietly changed; he could still be instructor of apprentices, and very gradually work his way in by doing some of the more difficult jobs in his new location until the edge wears off, or until few or none will notice his efforts, and he is accepted as a matter of course.

E H Stebbins
Worcester, NY

•

BACKWARD FOREMAN

Must a foreman be able to run all the machines in his department? Can he keep the respect of the men if his knowledge is more along leadership lines than practical experience?

IN HIS EMPLOYMENT, each man has a set of tools he uses to perform his work. In the case of a bookkeeper, it might be a pen, pencil, adding machine, or a computer. In the case of a secretary, it might be a typewriter, desk, and a dictaphone. In the case of most foremen or supervisors, the tools they work with are people. The foremen are usually never found out on the floor running machines and helping to get out production. Their work should be to find the right man for the right job, assign him to the proper machine, relay and interpret the necessary information, and see that the work is performed in the most efficient manner.

This assignment entails a certain amount of technical knowledge of the processes involved, and the more technical knowledge a foreman possesses, the better job he can do. In my opinion, however, the amount of technical knowledge necessary is secondary to a foreman's skill in handling men, his judgment in the selection of the right man for the right job, his ability to use good judgment in arriving at decisions, and his

"Well, that takes care of the question I was going to ask."

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Logan OFFERS YOU 2 MANUALS . . .

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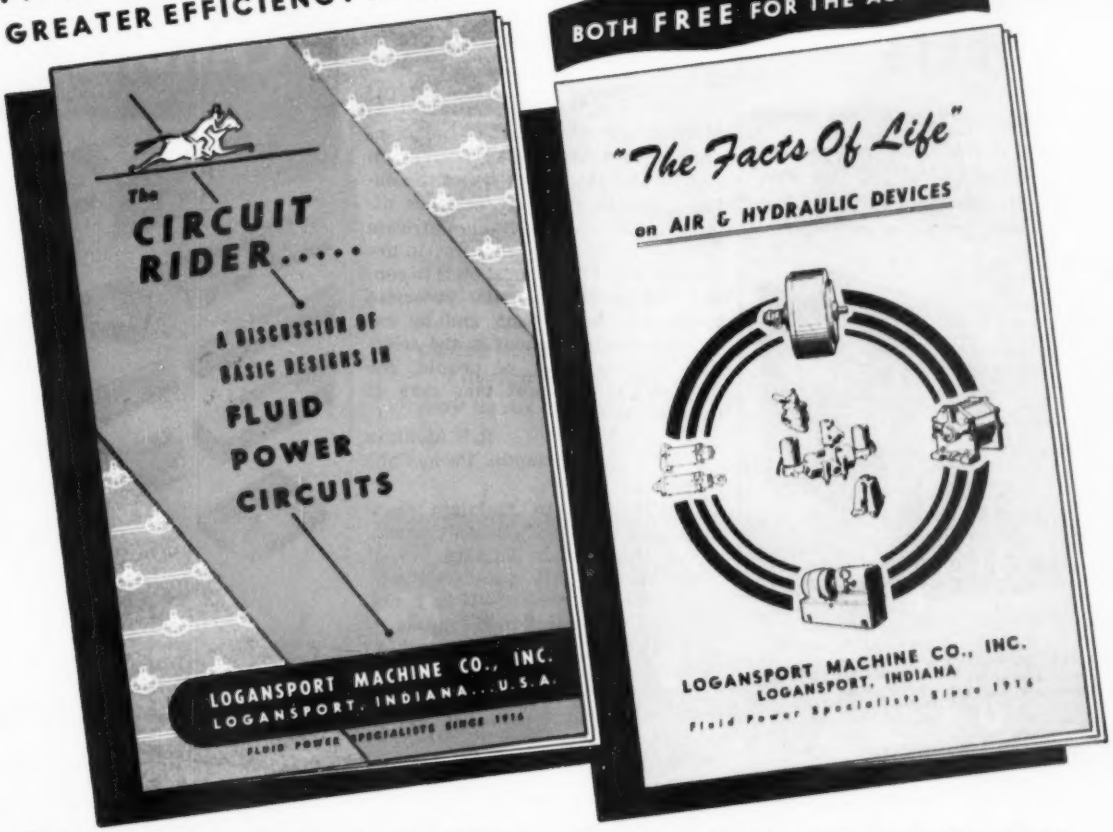

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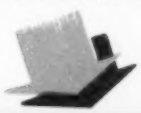

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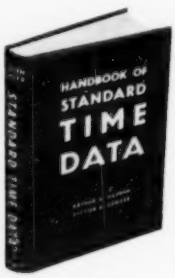
—for Machine Shops

by ARTHUR A. HADDEN, *late President; and* VICTOR K. GENGER, *Vice President, McClure, Hadden & Ortman, Inc., Management Engineers*



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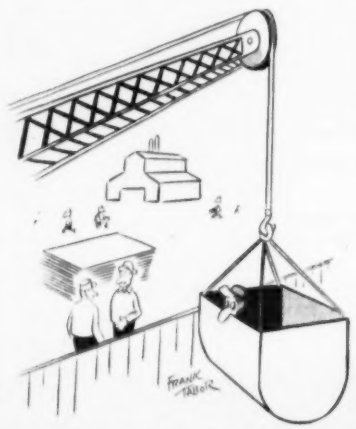
capabilities in communicating with his men and with his superviors. These qualities are distinct and separate from technical knowledge. If a man is capable of these things, the details of the processes involved are secondary. They do not lack in importance, but a man having the abilities described above will soon either master them or will learn in some way to compensate for the lack of knowledge.

Carrying Al's thinking a few steps further, the president of the company should be able to step down and handle any man's job in the entire organization. This becomes utterly ridiculous when the intricate operations of a large corporation are considered. A foreman's job is to control the people and the processes within his department, and by exercising good judgment in the selection and handling of people, the processes will almost take care of themselves.

R E Moulton
Huntington Park, Calif

CAN ANY FOREMAN maintain discipline and respect if he can't handle all the machines in his department? The answer to Al's question is yes, if he is a good foreman—if he is not, he could not maintain discipline or respect if he could run everything in the shop.

I remember in a very large contract shop (largest in the south) where the management placed a foreman in the shop who was not even a machinist; he could not run any machine. If he wished to speak to one of the men operating a vertical boring mill, he had to stand with his back to the machine or he would get sick. Yet in less than ten days he had the respect of every man; his quiet-spoken manner meant just one thing, and that was discipline. While he did



"I'm sure the men are sneaking out for coffee, but I can't figure how they get in and out."

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Controlled Quality
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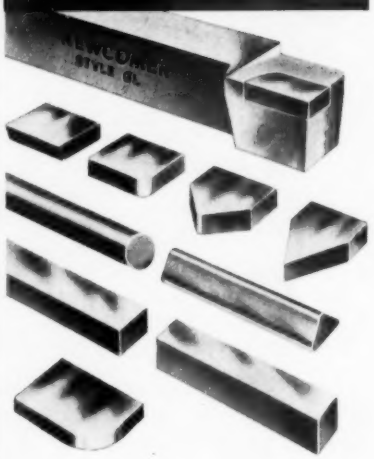

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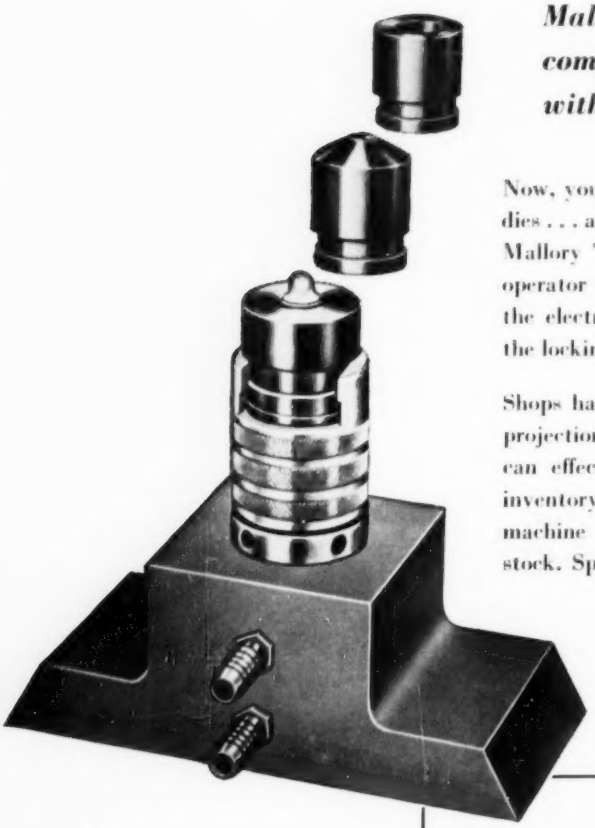

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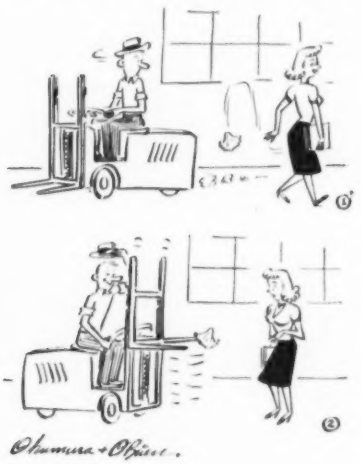
not know how to turn a piece of metal into the finished product, he knew management and blueprints and how the finished material should be. His judgment on many a knotty problem was better than the "old heads" who knew all the answers. He had the common sense that so many foremen lack. He could spot at a distance that a man was having trouble; he would walk up to him, puff on his pipe and suggest that they go over the prints. This of course caused the man to shut his machine down, and in the few minutes they discussed the print or the problem, nine chances out of ten the man had the answer to his trouble.

Of course all men may not have the management knowledge that this man did, but I have seen in shop after shop where higher management who had successful foremen and good harmony in the department, picked the man for his knowledge of how to operate men and not machines. Sometimes the most skilled makes the worst foreman; because of his skill, he expects others to perform as well as he does.

I remember one of the most disliked foremen in a large naval shop who was the most skilled. His men dreaded a rush or pressure job; they knew he could do it better and faster than they and he did not mind telling them so. In the next department was a foreman whose crew was always on the ball, yet he never raised his voice, he never took over a machine to "show" the men. Their production was always higher than the other crew. One day when we were all talking about the hunt for skilled machinists and the breaking-in trouble we all had with new men, the highly skilled foreman stated, "The first thing I do to a new man is hand him a double Acme left-hand thread to cut; if he does not come up with a good job in a given space of



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FOR QUICK, ASSEMBLY LINE USE
The laminations of the LAMISOL Shim (in brass only) are temporarily joined by spot-soldering on the edges. Gauges and number of laminations within one shim are unlimited.

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The little tab holds shim laminations together firmly, yet is easily removed. Different metals can be used in the same shim.

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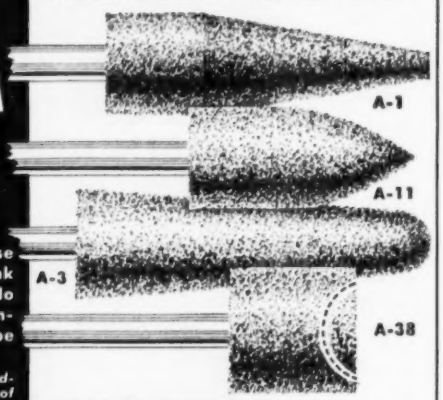

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Once a Ruthman Gusher Coolant Pump is installed it requires little or no attention. The pre-lubricated heavy-duty ball-bearings require no further lubrication, there are no packing glands to adjust. The dynamically balanced rotating shaft minimizes vibration and wear. Minimum power is consumed when the Gusher is throttled down. You are sure of low cost operation when you specify Gusher Pumps on your machine.

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time, I move him out." The other foreman replied "I'm afraid that had I gone to work under you when I came here, I would not have lasted very long. I have never cut an Acme thread in my life and doubt if I would know where to start." Did he lose respect of his men? No, it was forgotten in five minutes. His men did not give a damn if he couldn't even chuck a piece of iron; they knew when the chips were down he would come up with the right answer.

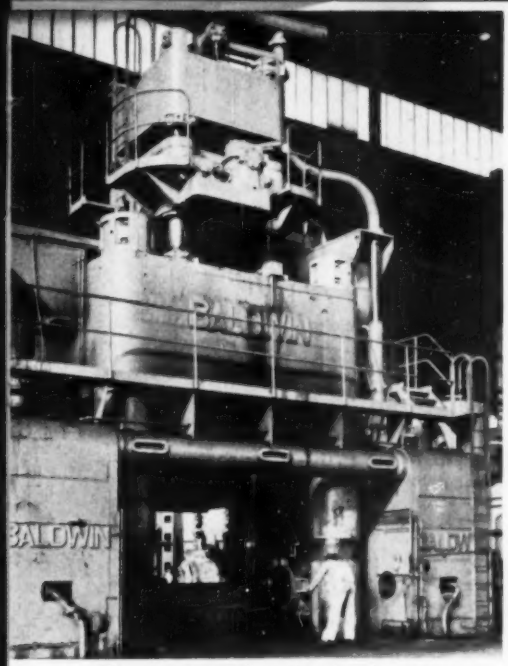
It amounts to one thing and one thing only, a foreman is not selected to run a machine; he is selected because of his management ability. If he is management material he is a good foreman who will maintain discipline and respect, even though he does not know how to run all the machines.

Chris Watkins
Savannah, Ga

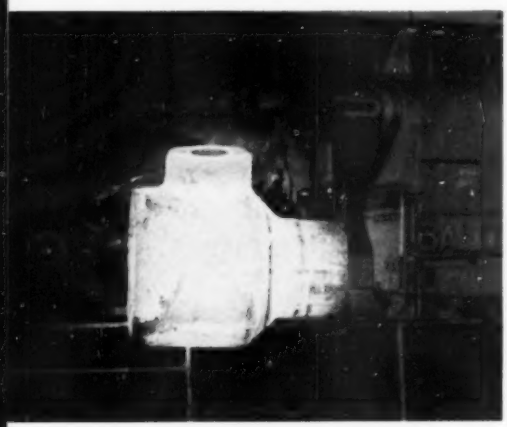
THERE IS A CERTAIN AMOUNT of gamble in the appointment of a new foreman, whether or not he comes from the outside. If the man comes from the inside, there is no doubt he has shown some of the potential characteristic qualifications that make up good foremen. Even though he has had no experience in operating machines, he may possess the know-how of using the tools (the men) that do operate them. There are certain ways of getting good results by an indirect method in the business of supervision.

The men are the main tools with which a foreman works. If he comes to the new job with an honest, open mind, he will soon gain the respect and confidence of the men under his direction. Once such a relationship

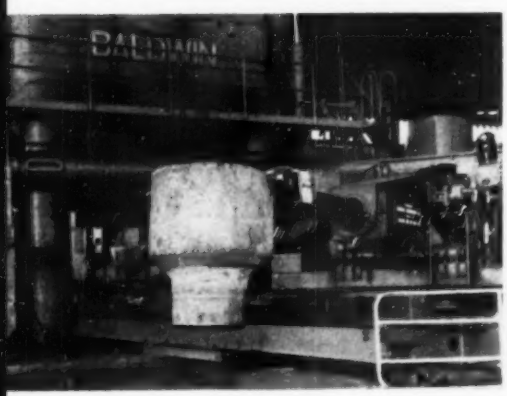
"Crib or no crib—stop putting diapers on our tools!"



The horizontal split die has just opened after forging a throttle valve body.



The throttle valve body, having been pierced by the two side acting rams and the down acting ram, is removed from the die set.



The manipulator is placing the 3,590 pound forging to one side for further processing.

SAVING MONEY BY *Forging*

A 3590 POUND THROTTLE VALVE BODY

A large size and intricate shape has been forged at Cameron. The result—homogeneous shapes, controlled grain flow and less machining time. Truly a new era in steel forging.

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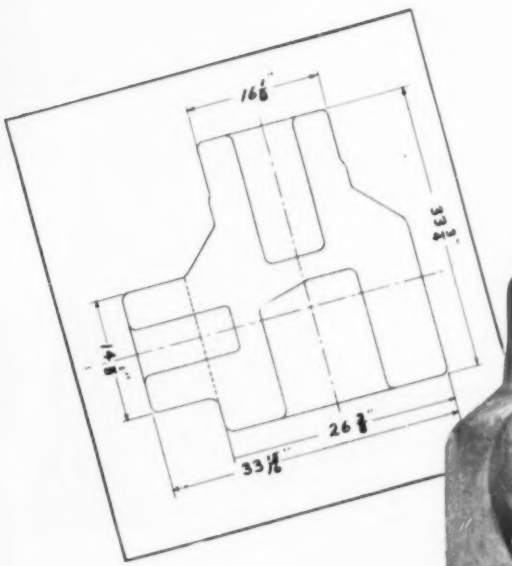
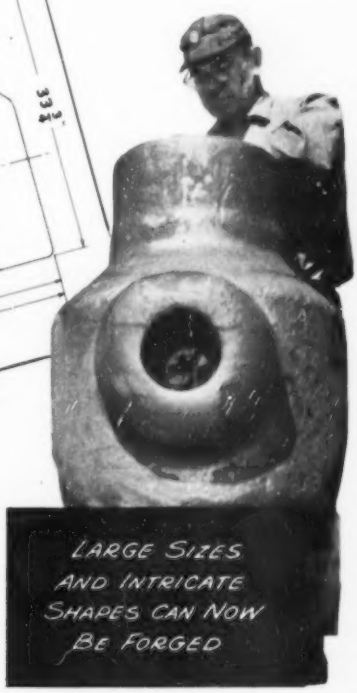
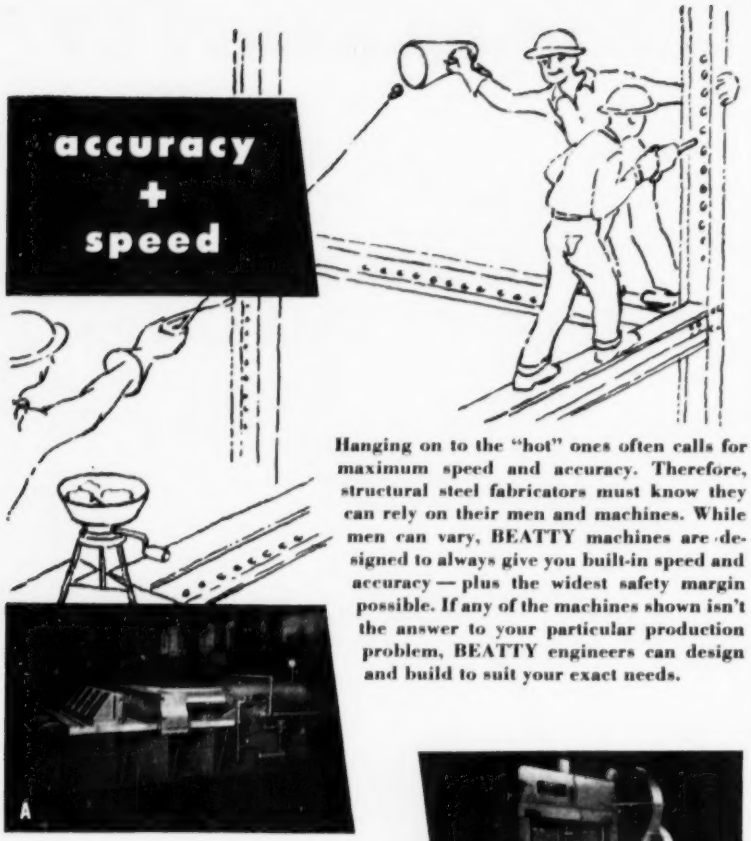
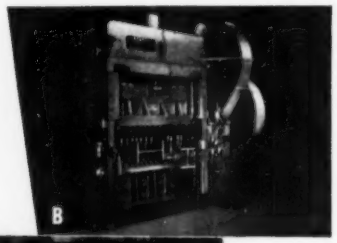


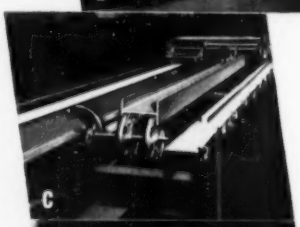


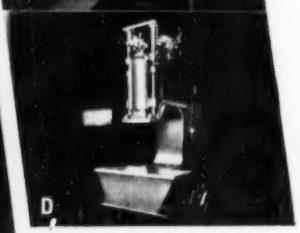
LARGE SIZES AND INTRICATE SHAPES CAN NOW BE FORGED

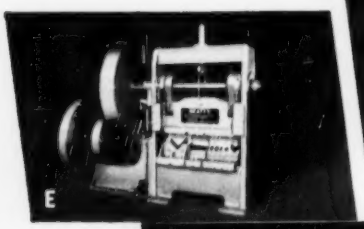


Hanging on to the "hot" ones often calls for maximum speed and accuracy. Therefore, structural steel fabricators must know they can rely on their men and machines. While men can vary, BEATTY machines are designed to always give you built-in speed and accuracy — plus the widest safety margin possible. If any of the machines shown isn't the answer to your particular production problem, BEATTY engineers can design and build to suit your exact needs.









A. BEATTY Horizontal Hydraulic Bulldozer for heavy forming, flanging and bending.

B. BEATTY Guillotine Beam Punch. Punches webs and flanges in "I" beams from 6 to 30 inches.

C. BEATTY Spacing Table handles web and flange punching without roll adjustment.

D. BEATTY Gap Type Press for forming, bending, flanging, pressing. Capacity 250 tons.

E. BEATTY Guillotine Bar Shear for angles, bars, rounds, squares without changing tools.

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MACHINE & MFG. CO.
HAMMOND, IND.

has been established, the department will set about to correct that which has been wrong. The main interest of the new foreman from then on will be to maintain such a relationship. A good relationship between men and the foreman is the key to better work and greater production.

Pencoyd Charlie
Los Angeles, Calif

•

MEDDLIN' MANAGERS

What's the best way to handle the executive who delights in puttering around the shop, particularly during a heavy-schedule run? Is patient attention the answer, or will tactful hints do the trick?

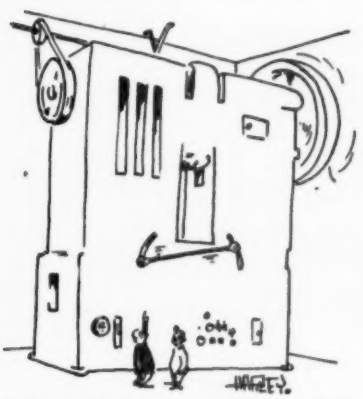
I HAVE HAD A FEW EXPERIENCES such as Al's, but always cleared these without undue tension.

Instead of letting it get my goat, I went to the party whom I thought was butting in and had a talk, stating just how I felt about the proceedings, and in every case we came to a complete understanding.

Men like Johnson who hold high executive positions are big enough to see your side of the problem at once if you will call their attention to how you feel, but don't go at him as if he were a burglar; talk to him on a man-to-man basis and you will get satisfactory results every time. At least that has been my experience.

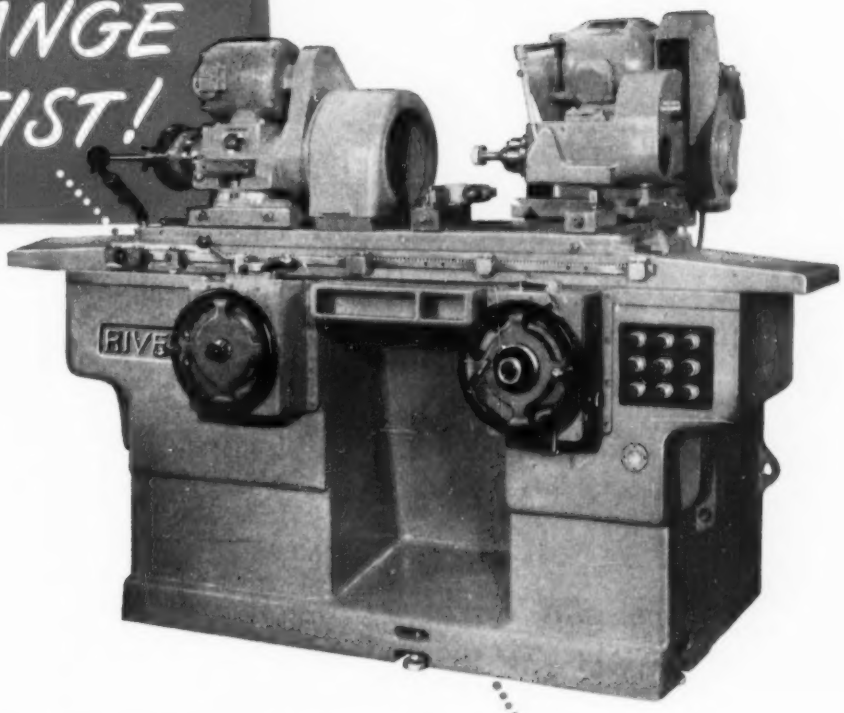
If Al knew the fixture in question was not doing the job properly, he should have consulted the tool engineering department and had them look into a more satisfactory design. If Johnson knew the design was wrong, he should have called Al's attention to it instead of going over his head.

One thing more the man higher up should remember, and that is he is paying the foreman to get out the work in the quickest and best



"This machine here puts the eyes in the needles."

QUICK-CHANGE ARTIST!



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INTERNAL AND UNIVERSAL GRINDER

- Grind holes 1/8" to 9" dia. and plug gauge to 6" depth—or to approximately 14" by retracting wheelhead slide.
- External grinding to 12" dia. by 21" length.
- Internal spindles 6,000 to 35,000 R.P.M.
- External spindle has double row roller bearings for radial load and ball bearings for end thrust.
- Double swivels on cross slide for two angle internal and external grinding.
- Sine bar measures swivel of workhead or table for perfect taper grinding.
- Workhead spindle mounts draw-in collets and step chucks directly.

has double-end wheelhead—*
Eliminates costly delay in
converting to external work

* Machine can be furnished with single-end wheelhead for internal grinding only.

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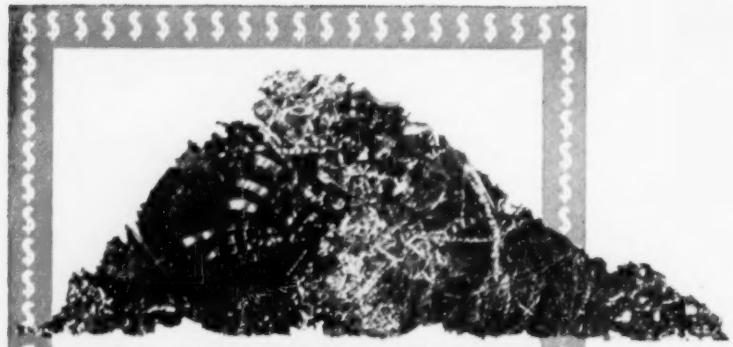
For More Precision Work RELY ON RIVETT LATHES AND GRINDERS, The Master Craftsman's Master Tools



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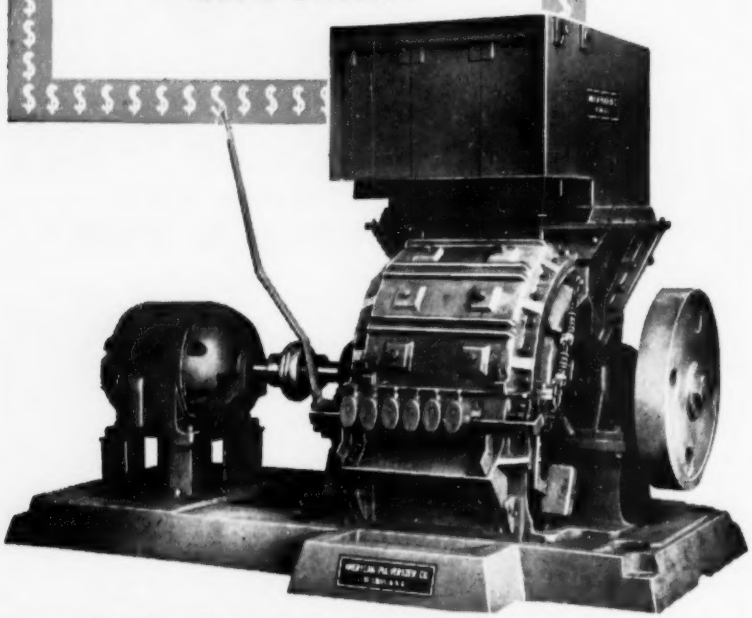

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way possible and if he does not do this, it is up to him to take the matter up with him.

The foregoing would lead to better relations all around and would not put the foreman on the spot with his men, which is a bad thing.

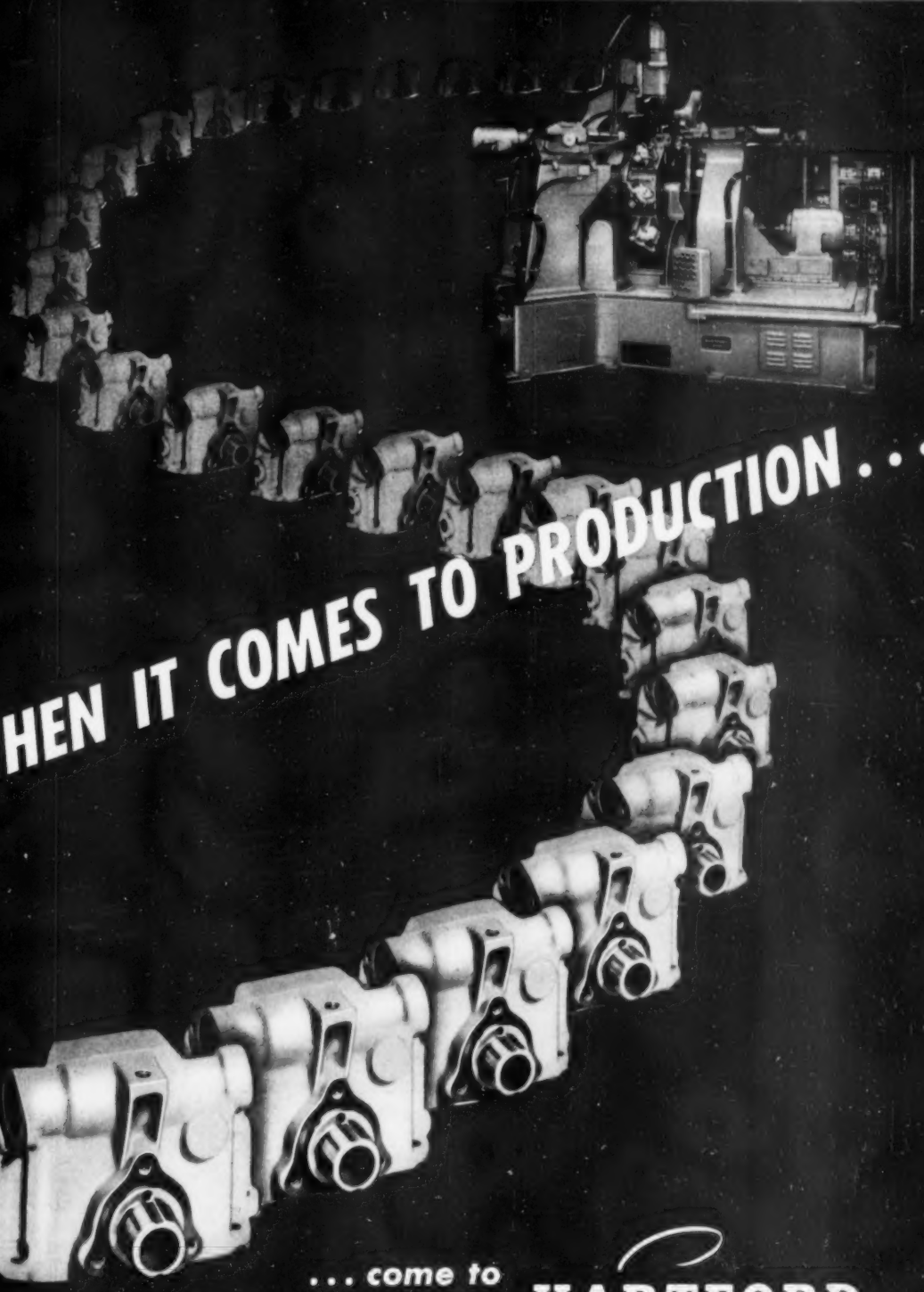
Wm C Betz
New Britain, Conn

I CAN UNDERSTAND Al's problem with meddlin' managers as I have experienced the same thing myself. They come into the shop, order the operator to stop the machine, and set up for experimental work. They don't bother to tell the department head or the foreman. They like to show their authority, causing resentment and discord in the department. It becomes evident to the foreman that the manager does not trust him.

This is, however, very often the foreman's or department head's fault. They are critical of everything the manager does in the shop. Their attitude is that a manager does not know anything except how to manage.

I would suggest to Al the next time the manager comes around he volunteer to help in the experiment—find out in what way he can be of any assistance. Find out in a friendly way what the manager has in mind; be interested. When we are interested in others they become interested in us. Ask question, make suggestions. Get the manager's point of view. Share some of your own ideas with him, and ask what he thinks. It is every man's right to be enterprising. Even the elevator operator or the man who sweeps the floor has ideas. Listen eagerly to all the manager has to say; you will find him glad to confide in you. Seek every opportunity you can to be of some help. Develop a desire to seek a free and easy exchange of ideas,

DESIGN 0312A26
READING TIME: — 10 MIN. 20 SECONDS — AND YOU'D BETTER READ 'EM — ENGINEER ON THIS JOB 6FT 9in 225 LB. FORMER FOOTBALL STAR



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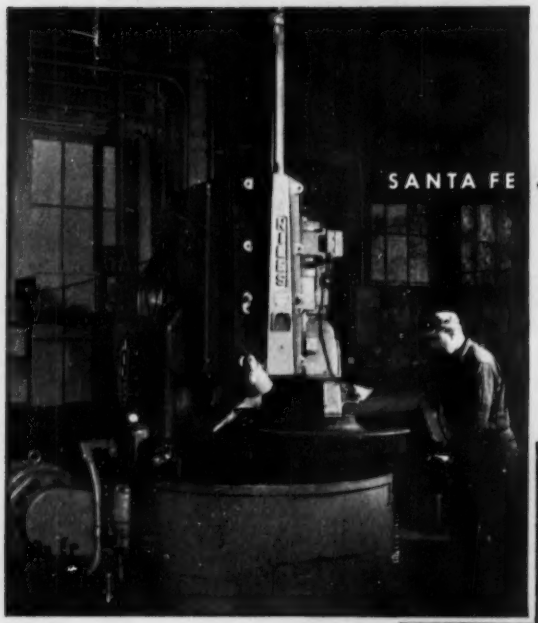
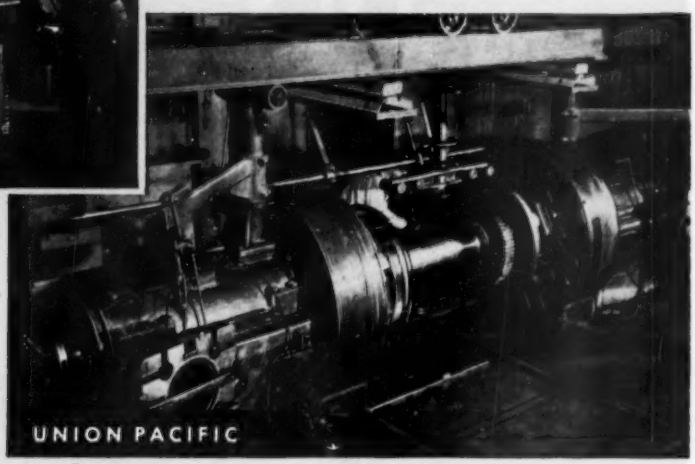


◀ Niles car wheel borer

Fast, accurate, push-button machining means big savings in time for the Atchison, Topeka & Santa Fe Railroad. Above, a car wheel is being loaded into the Niles 48" hydraulic car wheel borer in their San Bernardino (Calif.) Shops.



▲ Niles 52" car wheel lathe

Better than 50% savings in wheel re-turning time resulted when the Union Pacific installed this Niles wheel lathe with tungsten-carbide tipped tools and profiling attachment. The UP Los Angeles Shop can turn down a wheel in about 20 minutes. Photo shows rear view of lathe finish-profiling a large wheel set.

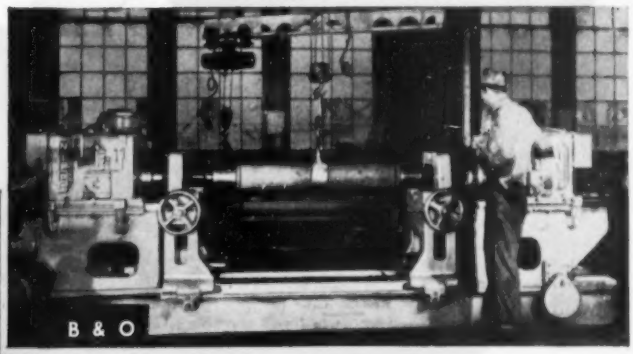
BALDWIN · BLH · LIMA-HAMILTON

BALDWIN-

NILES TOOLS
wheel shop costs

Niles end drive axle lathe

In their Altoona Shops, the Pennsylvania Railroad turns complete axles on this Niles end drive axle lathe with four carriages. This lathe has the modern controls, feeds and speeds which enable most users to machine an entire axle in less than half the time ordinary methods require.



Niles hydraulic axle centering machine

This Niles machine centers axles faster and more uniformly for the Baltimore & Ohio Railroad in their Glenwood (Pittsburgh) Shop because chucking is automatic and, therefore, more positive. Precise concentricity results in minimum waste of metal and time in machining that follows.

Niles hydraulic burnishing lathe

The first machine of this type built by Niles Tool Works is burnishing the outer journal of a freight axle in the Roanoke Shop of the Norfolk and Western Railway. Hydraulic power speeds all loading and adjustments, avoids operator fatigue and accidents. Photo suggests how this modern burnishing lathe produces a uniformity of finish to further reduce hot box frequency.

LIMA - HAMILTON

HAMILTON DIVISION HAMILTON, OHIO

NEW MANCO RIVETEER

HIGH PRESSURE HYDRAULIC RIVETING

- **Fast, Silent, Powerful**
- **Compact, Light Weight**
- **Self-Contained, Direct High Pressure Pump**

Here's top efficiency in hydraulic riveting that not only is fast and easy on the operator, but assures better riveting. Easy to operate hand lever valve mounted on riveting head. Direct pump to cylinder connection eliminates intermediate valving and solenoids, making for low maintenance—trouble-free operation. Adjustable pressure setting for use on straight or shoulder rivets. Full swivel about cylinder axis permits easy placement. Compact electric hydraulic pump. Standard riveteers available in 10, 20, and 35-ton thrust models. Higher tonnages available in special models.

Model R-211-188 E.
Develops ten tons thrust.
Weighs 18 lbs.
See catalog for other models.

Please send Riveteer Catalog

MANCO MFG. CO.,
Bradley, Illinois, Dept. AM 128

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saving the good ones and discarding the rest.

The three most important things that produce good production are willing workers, capable management and efficient machines. For that reason we must help management; when we do, we help ourselves. I am quite sure if Al were to follow some of these good principles of human behavior, he would find the manager coming to him with his ideas and problems. It's a good way to manage meddlin' managers.

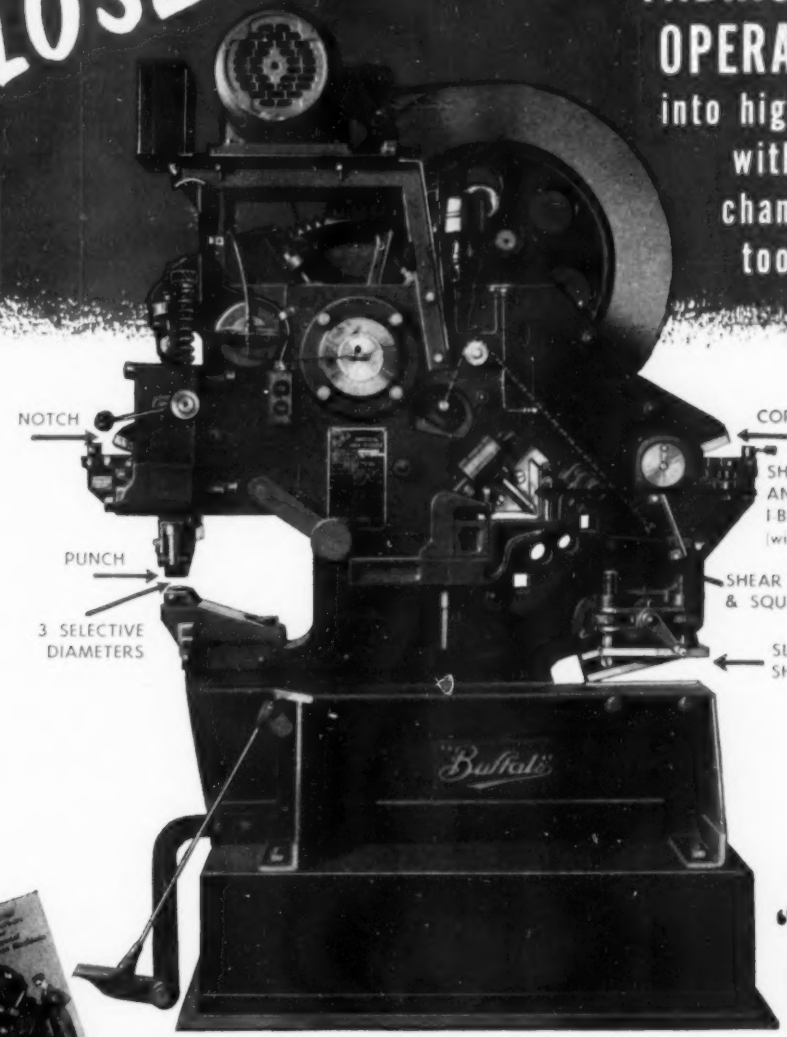
A E Salmons
Philadelphia, Pa

THE FUNCTION OF A MANAGER, in the broad sense of the word, is to coordinate the work of all the departments in the plant, so that the various units will work together as a team and maintain a free flow of production. Unless appealed to, the manager should never attempt to interfere with the regular routine of a department. If he sees anything while passing through a department that looks as though it could be altered or changed, in his opinion, to increase departmental efficiency, then the correct thing to do is to approach the foreman and broach the subject.

In the military services there is often a great deal of fun poked at the phrase "through channels," or "the chain of command," but actually these huge establishments would function very inefficiently if the underlying idea of these phrases were neglected. In other words, while a colonel is responsible for the performance of a regiment, and is dissatisfied with the conduct of a

"You're right! Those aren't safety glasses . . . they're 3-D viewers!"

TAKE A CLOSE LOOK— at the single machine that can put all these FABRICATION OPERATIONS into high gear— without changing tools!



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"Takes the space of one machine — takes the place of five"

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We help our customers write success stories

Every day 200 Oakite Technical Service Representatives use Oakite cleaning materials and methods to help thousands of Oakite customers accomplish metal-cleaning jobs that are important parts of big production operations.

When a busy customer sends a few words of appreciation, we treasure those words as a *success sentence* that we have helped write in his *success story*.

Here are brief explanations of the *success sentences* quoted above:

1. After 6 months use of Oakite Special Protective Oil for preventing rusting, this manufacturer of precision steel parts estimated savings at more than $6,000.
2. The use of Oakite Composition No. 95 for conditioning zinc-base die castings before plating cut cleaning rejects for this hardware manufacturer and showed other "very fine advantages."
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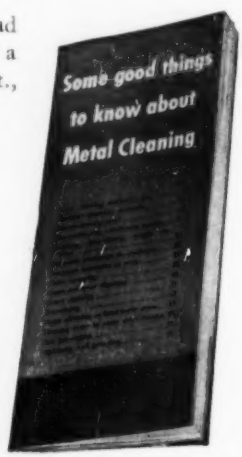
How about your success story? We'll be glad to tell you how we can help. Just drop a note to Oakite Products, Inc., 24 Rector St., New York 6, N. Y.

FREE Ask for our booklet "*Some good things to know about Metal Cleaning.*" It discusses our methods for:

Tank cleaning	Pre-paint treatment
Machine cleaning	Burnishing
Electrocleaning	Paint stripping
Pickling, deoxidizing	Rust prevention



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OAKITE
MATERIALS • METHODS • SERVICE

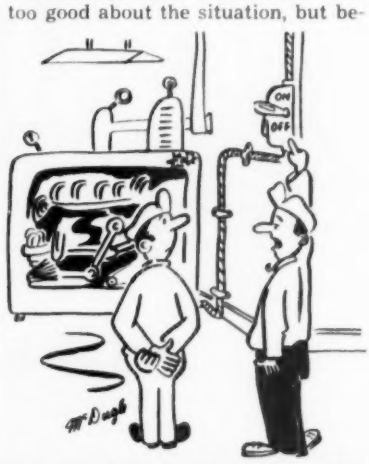
Technical Service Representatives in Principal Cities of U. S. and Canada

company, he does not go to a sergeant of that company and make a suggestion or complaint, but obviously makes a point of getting his message across to the company commander.

In the shop, of course, we have all seen the manager who has come up from the ranks, and to whom the idea of sitting behind a desk and directing things from there comes very hard indeed. But it is a curious thing that these individuals are the people who have respect for a foreman's sense of responsibility and his operation schedule. If they see anything that can be improved, they consult the foreman and get his reactions—they never "tinker."

There is another breed, "the home workshop boys," as an old Navy Yard friend of mine used to call them, who harbor the delusion that because they have a lathe or drill-press in their cellar workshop at home, and putter around in their spare time, they have acquired a sound knowledge of machine-shop practice. In the particular Navy Yard where my friend was supervisor, he was afflicted with the same problem. One brass hat in particular, a commander who should have known better—used to come into his department and get into conversation with the boys at the machines. If he met the right individual, and there is usually a certain quota who are suitably impressed by rank, and get a kick out of conversing with the brass, in no time at all he had this machinist exchanging opinions and expanding theories on the particular job in process. In one case this officer had a man changing the setup on his machine for some unworkable Rube Goldberg idea of his own, all without sanction of the foreman who had to clean up the mess later.

Naturally, the foreman didn't feel too good about the situation, but be-



"I understand the operation of this machine fully except for one thing. What's this little lever for?"

H. J.
Here's a really fantastic letter!
P.W.

BANNER TOOL COMPANY

BANNER tools DETROIT — *Fine* TOOLS FOR INDUSTRY

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DETROIT 12, MICHIGAN

June 16, 1952

Cities Service Oil Co.,
3049 E. Grand Blvd.,
Detroit 2, Michigan
Attention: Mr. P. E. Watts

Dear Sirs:

We called upon the services of your lubrication engineer, Mr. A. J. Blake, in reference to a serious staining condition which we were having with our soluble oil. He analyzed this condition and recommended one of your Chillo Oils. This oil was tried and the rust condition eliminated to our satisfaction.

To our surprise on his next visit he was dissatisfied with our tool life and suggested we use a soluble oil called "Chillo A". Now not only do we have clean machines, but tool life has been increased 20%! While in our plant he asked permission to "look around", which, of course, was granted.

We were using a tapping compound with precision ground taps in order to hold to close tolerances. We did not consider tap breakage excessive but the removal of broken taps was sometimes rather expensive. He recommended we use "Chillo 10Z". Then came the surprise of our lives! With Chillo 10Z we have gone to commercial ground taps (a 300% savings) and can still hold our same tolerances, with a sharper thread, increasing tap life a minimum of 20% plus eliminating expensive removal of broken taps!

We also have a production stamping job which required a new set of dies every month. On his recommendation we tried Chillo 10Z with these dies. Now our die life has increased to at least two months...a saving in die life of 100%, disregarding labor costs. We also increased production 200% per die sharpening!

We tried the same oil on our broaching operation and found that instead of making two cuts we can get the same results now with one. We were using one of your competitors' hydraulic oils and you told us it was a "good oil" and would give us satisfactory performance. BUT, GENTLEMEN, WITH THE EXCELLENT SERVICE YOU HAVE GIVEN, PLUS THE TIME AND MONEY SAVED, YOU MAY REST ASSURED THAT ALL OF OUR LUBRICATING REQUIREMENTS WILL BE PURCHASED FROM YOU.

Yours very truly,
BANNER TOOL COMPANY

S. F. Olesak
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SFO:sd

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. . . . for more efficient production of wire forms and small metal stampings requiring swaging, piercing, stamping, blanking or coining and forming.

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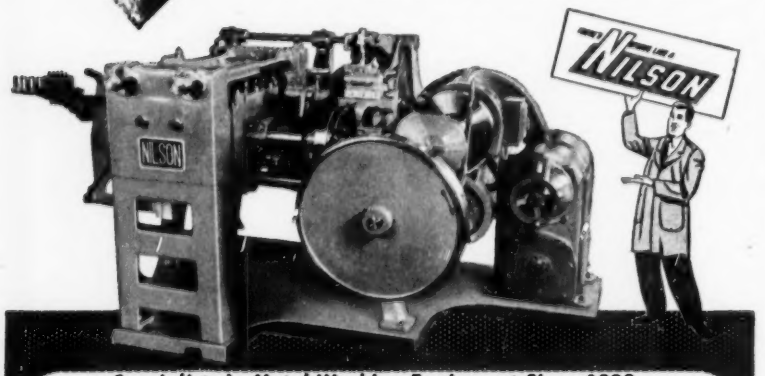
NILSON FORMING MACHINES available in a wide range of sizes to form wire 1/32" to ½" diameters and up to 3½" wide ribbon stock.

For specific recommendations, send prints or samples of your operation, when requesting bulletin.



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ing a resourceful individual, he came up with a solution. He had it circulated around the shop that in no circumstances should a setup be changed without his okay. Also, via the grapevine, he made it known he frowned on "visiting" at the machines. Any man who had a visitor for more than five minutes, no matter how exalted his caller, was apt to suffer a downward trend in his quarterly efficiency rating. It took a little while, but gradually the visiting brass caught on to the idea that while the boys at the machines would discuss the weather or any other subject up to the allotted time, if the visitor showed signs of staying longer, the machinist would excuse himself — he either had to visit the toolcrib or see a man about a dog. This solved my friend's problem and it might give our Round Table duo, Ed and Al, some ideas.

Short of taking direct action and having a showdown on this particular type of meddling, it might be more tactful and diplomatic to suggest to the big boy that he set up a research laboratory for his own use when he feels the urge to create.

Then again, there is the tactful telephone call, that requests Mr Big's presence in another department, when all else momentarily fails.

Actually, a nuisance of this type can sometimes act as an incentive to the foreman by making him check every process in the shop that is likely to come under the scrutiny of the manager, so that there is no valid reason for "tinkering," which probably originated the phrase "nuisance value."

Robert S Alexander
Greenville, RI

IF THE FACTORY MANAGER was really meddling with Al's men and their work, he has a real grievance. The chances are that he was trying to get the "feel" of the shop and to get to know the men, hoping they would find out that he was a real human being like themselves. This takes more tact than many seem to have.

SWISS BLUE RIBBON PRECISION MACHINE TOOLS

Backed right here in the U. S. by skilled technicians, factory service and guarantee, and spare parts readily available from every Hirschmann Branch.

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A Nelco field engineer will be glad to call — "troubleshoot" in your plant—on your machines —save you production hours, production dollars!

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NELCO TOOLS

For that Extra EDGE in Production

NELCO TOOL COMPANY, INC., MANCHESTER, CONNECTICUT

It takes more than back-slapping and "call me Bill" stuff. If the factory manager has had real shop experience, as is likely, he knows enough of the shop operations. He may feel, and rightly, that if he can really get to know them, and have them know him, he can do his job better and improve the efficiency as well as the morale of the shop.

Few things can be more disrupting in a shop than to have one of the higher-ups really interfere with the orders given by the foreman. If the man from upstairs thinks that the work is not being well done, he should contact the foreman and see if it is being done according to orders, or whether the man has misinterpreted the orders. It is just possible that Al, or any other foreman, has made a mistake. But he is the one to do the correcting if that is the case, not the "upstairs-er."

It is essential that the factory manager be in close touch with his foremen, preferably through the superintendent, of course. While we kick at the red tape of Army procedure and are irked at the time it takes to go through regular channels, something of the kind is necessary to prevent stepping on someone's toes. And sore toes can do a lot of harm in any organization. We know that personality is a great asset for any foreman. It is even more valuable the farther up the line we go. The real head of any big concern needs to be a top-flight diplomat to keep everything going as smoothly as it should for best results.

One of the most successful master mechanics of a railroad I ever knew was a born diplomat. He had been appointed because he was somebody's cousin, knowing very little about railroad shop work. But he had a way with him. He would take me out in the shop for a look-see and when

"But Boss . . . You can't take it with you . . . and if you did it would probably melt."

Which Square D Control Center will do *Your* job best?

1. STANDARD
2. BACK-TO-BACK
3. DUST-TIGHT
4. WEATHER-PROOF
5. FILTERED AIR

1 Standard Square D Plug-in Control Centers in Nema I enclosures are designed for the majority of installations.

SQUARE D FOR FLEXIBILITY! Square D's plug-in units can be removed, added, or exchanged at will. Both fusible switch and circuit breaker types available. Standardized sections and units are 100% reusable after plant conversions or rearrangements.

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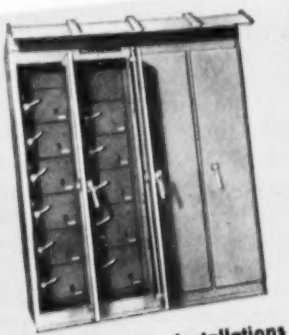

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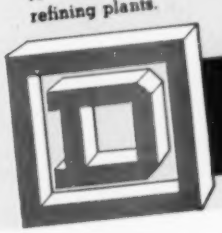

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These switches operate to maintain the speed of the machine at the same number of pounds stretch per inch width throughout the handling process.

Plant engineers in all lines of industry are finding that the application of one or more of these precise, easily mounted switches is the most practical and economical way to make present equipment safer, more automatic and more productive.

Authorized MICRO distributors are located in over 100 key cities with complete stocks of switches best suited to individual plant requirements. Look for your nearest distributor under "Switches, Electric" in your classified phone book. For more detailed information, help is always available from your nearest MICRO branch office.

For live, practical ideas on switch applications, send for MICRO TIPS. We'll be glad to add your name to our mailing list.

MICRO
MAKERS OF PRECISION SWITCHES
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A DIVISION OF
MINNEAPOLIS-HONEYWELL REGULATOR COMPANY

I spotted something that interested me, he would call Jack, the foreman, and ask him to get Bill to show me the new tool he had made. This kept the foreman happy. Bill was very glad to explain the workings of the tool at the foreman's request. The MM kept out of the picture except to smile at Bill and the foreman and say something like this—"They tell me this is one of the best damn tools we ever made for this kind of work, and Jack here says it saves us a lot of time."

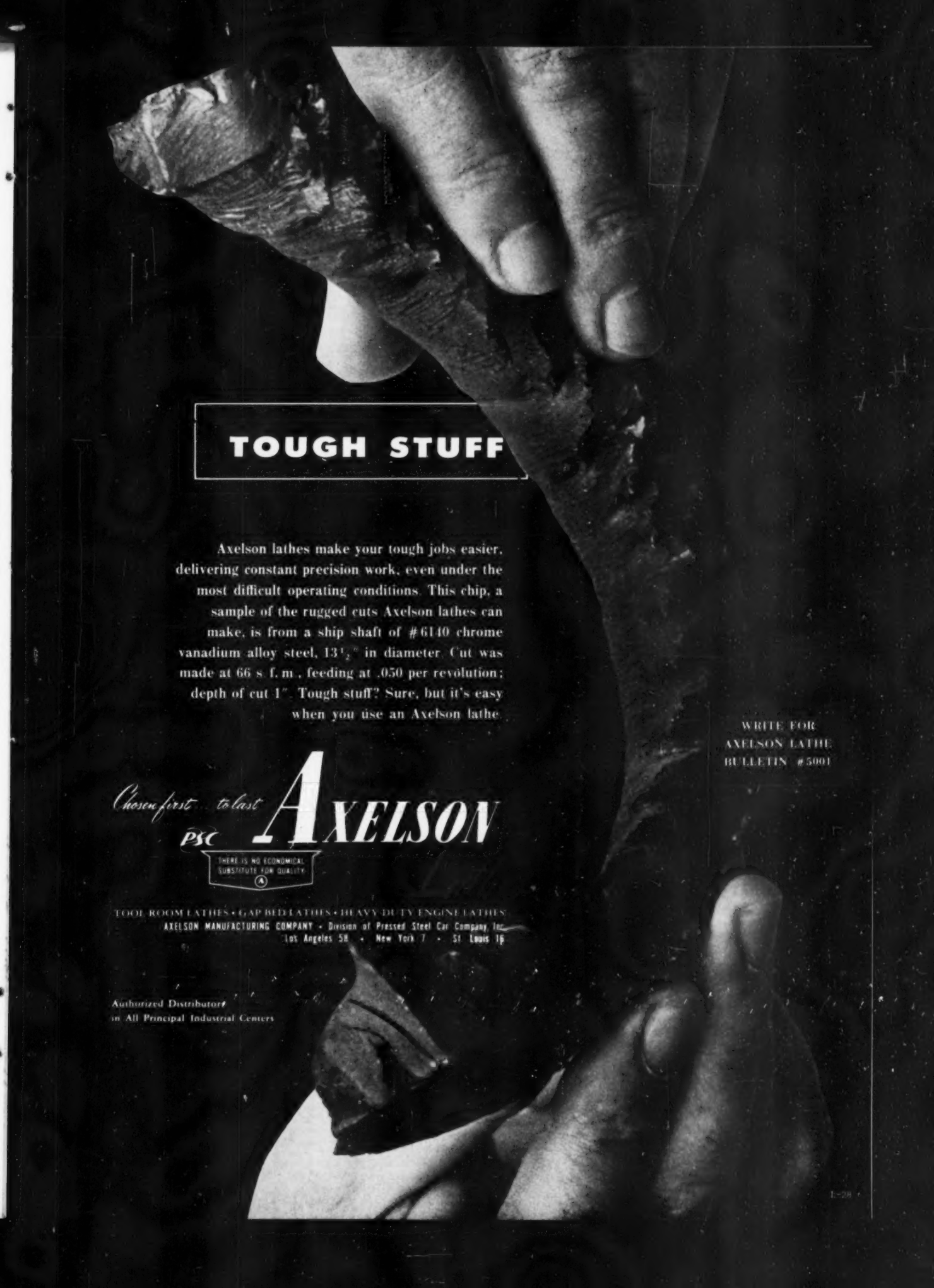
The MM didn't try to make anyone believe he knew a lot about shop work. He wasn't a back slapper, but he went out of his way to give all the credit he could to the foreman and to the men as individuals. He knew the men knew how and why he held his job. But the men all liked him and would do their best for him and his shop.

He had another habit, or more properly a method, of introducing new tools into the shop. He had been sold on the idea of a new turret lathe, but he didn't do any ordering of one until he had sold the idea to the foreman and to the man who was to run it. He first talked about it to the foreman. Then he had the foreman drive the operator to a neighboring town where he had seen one of these machines at work. They spent the best part of a day watching the kind of work it did and noting the time it saved. Both came back much enthused and asked the MM to order one for their work. When it arrived, the operator who came to demonstrate the machine had little to do but go over a few of the points.

If something of this kind could be done in more such cases, the demonstrator would be saved a lot of valuable time and new machines would be much more welcome than is always the case. If some of our statesmen had as much diplomacy as some shop men of this kind, we might not have to spend so much on our armed forces.

Fred H Colvin
Point Pleasant, NJ

"—American industry finally recognizing our glorious union. Now using Red lead in shops!"


TOUGH STUFF
Axelson lathes make your tough jobs easier, delivering constant precision work, even under the most difficult operating conditions. This chip, a sample of the rugged cuts Axelson lathes can make, is from a ship shaft of #6140 chrome vanadium alloy steel, 13½" in diameter. Cut was made at 66 s. f. m., feeding at .050 per revolution; depth of cut 1". Tough stuff? Sure, but it's easy when you use an Axelson lathe.
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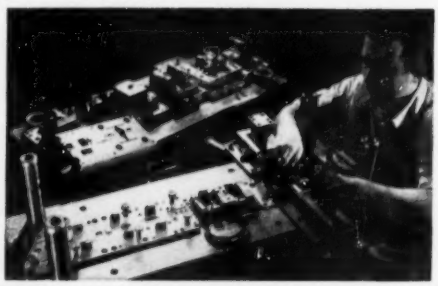
Thorough inspection of this 10 station progressive die for producing clips to link 60 caliber machine gun shells insures minimum time from production line to battle line. PRODUCTION PROVING from 10 to 50,000 pieces from the die guarantees "proving ground" quality like this —



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HOTSHOT FATHEAD

Is there any solution to the problem of trying to maintain peace in the department if you have a first-class machininst who won't keep that fact to himself? Is it better to fire the man, or try to point out to him that his arrogance infuriates everyone else?

ONE ENCOUNTERS this detestable character, Smith, in almost every shop; he is one of those who strives to place himself in the center of the stage and likes to think of himself as the chief protagonist.

The fellow who has an idea that he has only himself to consider is not worth his weight in salt. One of his kind is wrapped up in a cloak of comfortable ego; he's selfish to the core; and he feels that everything that he does or thinks is right on the button. He's the type who looks at the world through the wrong end of the telescope and prides himself on his bigness.

This type of an individual presents no easy problem for the busy foreman, especially if the self-singing egoist is one of his best men. Often the foreman is at the bottom of this detestable fathead's rise to his self-esteemed position by praising him too lavishly on his accomplishments. I should think that Al would sense one of his men's isolation and exercise preventive measures to put him in his place before the misguided fathead seats himself on the throne of superiority.

Usually a very valuable worker is of a likable type, big at heart, modest to a certain degree about his accomplishments, and sympathetic to his fellow workers who are not so fortunate in being gifted with superior skill and knowledge. If the self-puffed pain-in-the-neck thinks that he is irreplaceable, then Al should be the first to spot it and had better do justice to himself and the whole crew—as well as the erring

"My grandfather had all his teeth till he was over 70."

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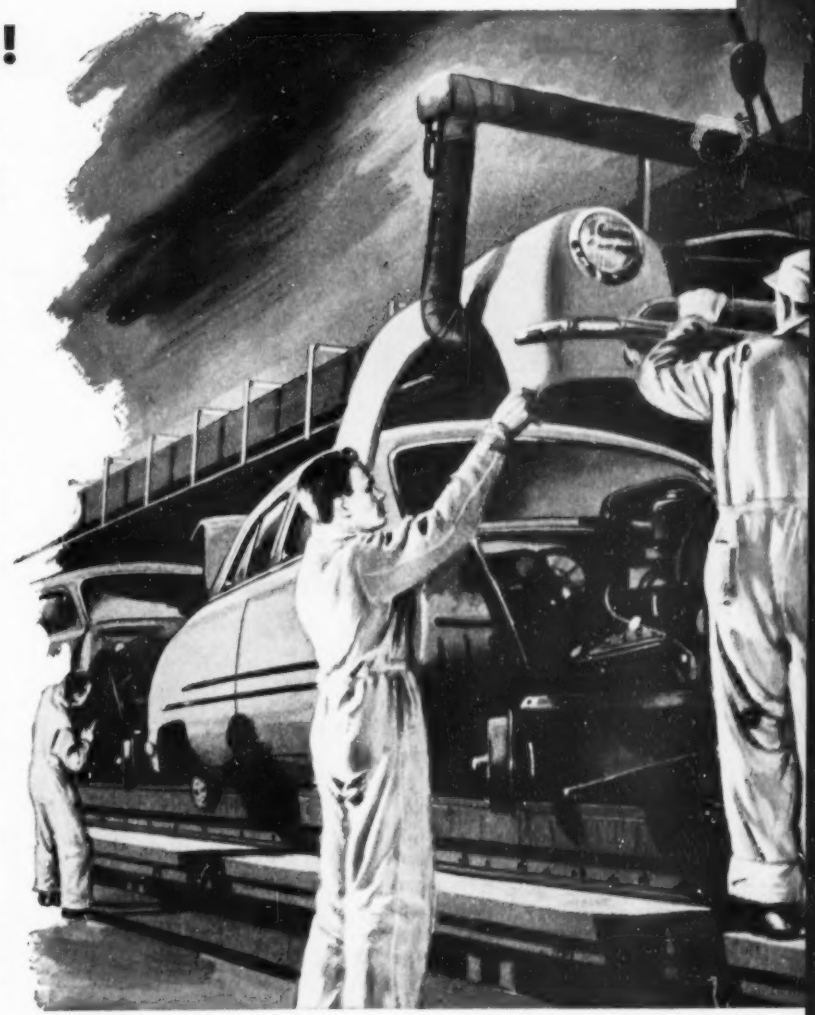
save $11 every 8 hours on one machine!

...cut downtime 80%!



Lubrication trouble on a vital machine in a big Detroit automobile plant. Gallons of oil being wasted. Man-hours climbing. Spilled oil creating a major housekeeping problem—hazardous working conditions.

A trained Alemite "Friction Fighting" specialist was called in. After careful study, he recommended the installation of an Alemite Lubrication System. A system that would lubricate all 55 bearings of the machine simultaneously!

The change was unbelievable! Foremen said they'd never seen anything like it! Within a 24-hour period, oil consumption was cut 20 gallons! Lubrication downtime was decreased 80%! Bearing temperature was lowered 40°! The housekeeping problem was eliminated! *Estimated saving every 8 hours—$11! A total of $2869 a year!*

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Alemite's 35 years of experience in conquering friction can work for *you*, too! An Alemite Lubrication Engineer can show you how to save. Help you to cut costs, decrease downtime, increase profits! For further information, contact your Alemite distributor—*today!*

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Wherever metal touches metal, wherever you find machinery in motion, you're most likely to find Alemite Lubrication and Lubrication Systems on the job. Here are but a few of the industrial leaders who use Alemite.

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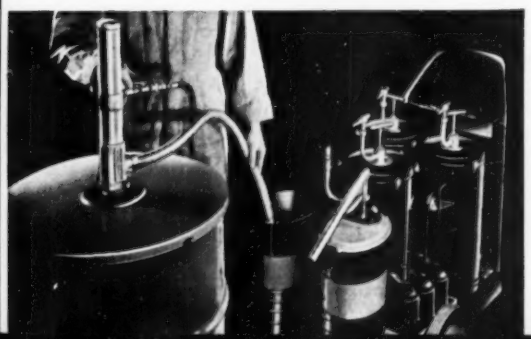

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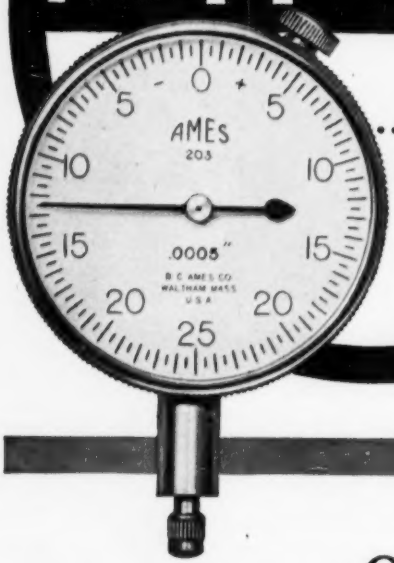

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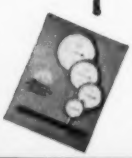

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one—by putting the skids under him at the earliest possible moment. The men look upon a foreman who encourages such a freak with grave concern and inwardly lose their respect for him.

To retain a man who is so uncooperative simply because he is an exceptionally good worker is a mark of weakness on the foreman's part. It has been proven time and time again that no man is so good that another can't take his place and do as well or better. Nothing is more sickening than a puffed-up hotshot who tries to give the impression that he's indispensable. Feeling that the foreman thinks that he is superior gives him a sense of transcendency, but in the opinion of the remainder of the crew he is a thorn in the side for all of them.

With such a man under him, I wonder how Al manages to summon the courage to tell him what to do. Al should say, "Look Bub, either you mend your ways or get the hell out."

One thing that stands out in his favor is that he treats a piece of machinery with respect. However, it isn't the skill he possesses, or the ability to turn out work in good time that rates the value of an employee; it's the ability he has to get along with his fellow workers in the department.

Smooth production demands full cooperation and it is a certainty that cooperation cannot be obtained when one member of a department thinks that he knows it all.

Seems to me that Al is putting the cart before the horse when he spends his valuable time soothing hurt feelings when he should remedy the trouble at the source. Let him kick the trouble-maker out and suffer a little inconvenience for awhile and he'll soon find out that more production will ensue as a consequence of the introduction of harmony in his department.

Rex Warren
Waterloo, Iowa

"Must have sent the wrong movie. I asked for one on carbide grinding."

for **BETTER**
Surface Grinding
Use **QUALITY** Segments

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3. HIGHEST QUALITY. Consistently uniform cool-cutting structure and exact specification are built in by BAY STATE under the most rigid standards of quality control.

4. PRICE ADVANTAGE. BAY STATE's special 8A abrasive, at a non-premium price, will work wonders on your tool room surfacing jobs . . . further, there is no extra charge for the BAY STATE bonus of outstanding, consistent performance.

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Send for latest BAY STATE Surface Grinding brochure.

Bay State Taps!

...on nearby shelves of industrial supply distributors

BAY STATE TAP & DIE COMPANY • MANSFIELD, MASS.

NEW BOOKS

PROGRESS IN SCIENTIFIC MANAGEMENT —*A complete catalog of current AMA publications. Published by the American Management Association, 330 W 42nd St, New York 36, NY. 30 pages. 6x9 in. Free.*

This is the catalog of the American Management Association's publications in eight fields of management. Included are books on personnel, manufacturing and production, office management, marketing, financial management, insurance, general management, packaging, and several research reports and other special publications. Also included are ordering instructions, schedule of discounts to AMA members and institutions, and standard order forms.

•

ANNUAL REPORT OF THE BOARD OF REGENTS OF THE SMITHSONIAN INSTITUTION — *Published by the United States Government Printing Office, Washington, DC. 461 pages, 3x9 in. Price, $2.75.*

This is the annual report of the doings of the Smithsonian Institution, describing the structure and affairs of the Institute, with a 442-page appendix equally divided between reports on the various branches of the establishment, and "a miscellaneous selection of papers (some of them original) embracing a considerable range of scientific investigation and discussion."

•

WELD STANDARDS—*Published by Lincoln Electric Co, 22801 St Clair Ave, Cleveland 17, Ohio. 19 pages, 8½x11 in. Paper bound. Price $1.*

Insuring uniformity in design and fabrication of weldments has always been a problem for engineers and quality control men. An important tool for aiding this is now provided by this set of data sheets printed on tough tracing paper and suitable for blueprinting. Copies can thus be supplied to all personnel concerned, and all the design engineer needs to do is to specify the Weld Standard designation and AWS symbol.

The standards give electrode size, polarity and current, arc speed, electrode melt-off rate, and other pertinent data for different plate thicknesses and for each different type of joint and welding position. Recommended procedures are those which will result in a weld equal to the plate in section and strength.

"The Frog and The Fox"

. . . a fable that will make sense to cutting fluid users!

The Fable . . . thanks to Aesop:

A skinny little old frog, who looked as if you could knock him down with a feather, jumped up on a log and started to croak. He told what a great doctor he was. He bragged that he could cure any ailment. He used a lot of high sounding words that nobody could understand.

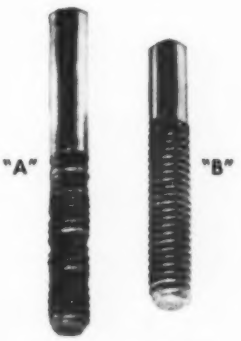
Finally, the Fox, who was pretty sly himself, said, "Frog, you pale, liver-spotted little weakling, you can't even cure yourself. Just saying you are a great doctor doesn't make it so!"

The Sense the Fable Makes:

You are often told that there are miracle-working cutting fluids that will cure all your problems in machining everything from brass to stainless. They often turn out to be like the phoney frog in the fable. Here is an example:

A Stuart Oil customer was using Stuart's SpeedKut B Cutting Oil on his Brown & Sharpe automatics for threading SAE 1020 material. He was induced to try a "do-everything" product on the job. Picture A shows what happened! Picture B shows the same job machined with Stuart's SpeedKut. The "frog oil" didn't have enough cutting value.

Ask to have a Stuart Representative show you how the correct cutting fluid for the job, correctly applied, can save you time, money and material. Use the handy coupon below.



with "frog oil" | with Stuart's SpeedKut B

More Than a "Coolant" is Needed

D.A. Stuart Oil Co.
EST. 1865 LIMITED

TIME-TESTED CUTTING FLUIDS AND LUBRICANTS

2729 S. Troy St., Chicago 23, Ill.

CLIP TO YOUR COMPANY LETTERHEAD AND MAIL
to D. A. Stuart Oil Co., Ltd., 2729 S. Troy St., Chicago 23, Ill.

Please ☐ Have Stuart Representative call
Check ☐ Send Booklet "Cutting Fluid Facts"

Your Name .....

Title .....

HOW DO YOUR CUTTING OIL COSTS COMPARE WITH ANTISEP ALL PURPOSE BASE?

Chances are you're paying much more than 8¢ per gallon in the machine . . . the average cost of Antisep All-Purpose Base. And Antisep All-Purpose Base also gives you these extras:

. . . . *VERSATILITY*
one cutting fluid to do 90% of all jobs

. . . . *LUBRICITY*
to withstand pressure and reduce friction

. . . . *ANTISEPTIC PROPERTIES*
no skin sores, no rancid odors

. . . . *FILM STRENGTH*
which gives you longer tool life

. . . . *COOLER WORK*
which can be handled bare-handed

THIS ANTISEP USER CUTS 80% OFF COOLANT BILL AND INCREASES TOOL LIFE 83%!

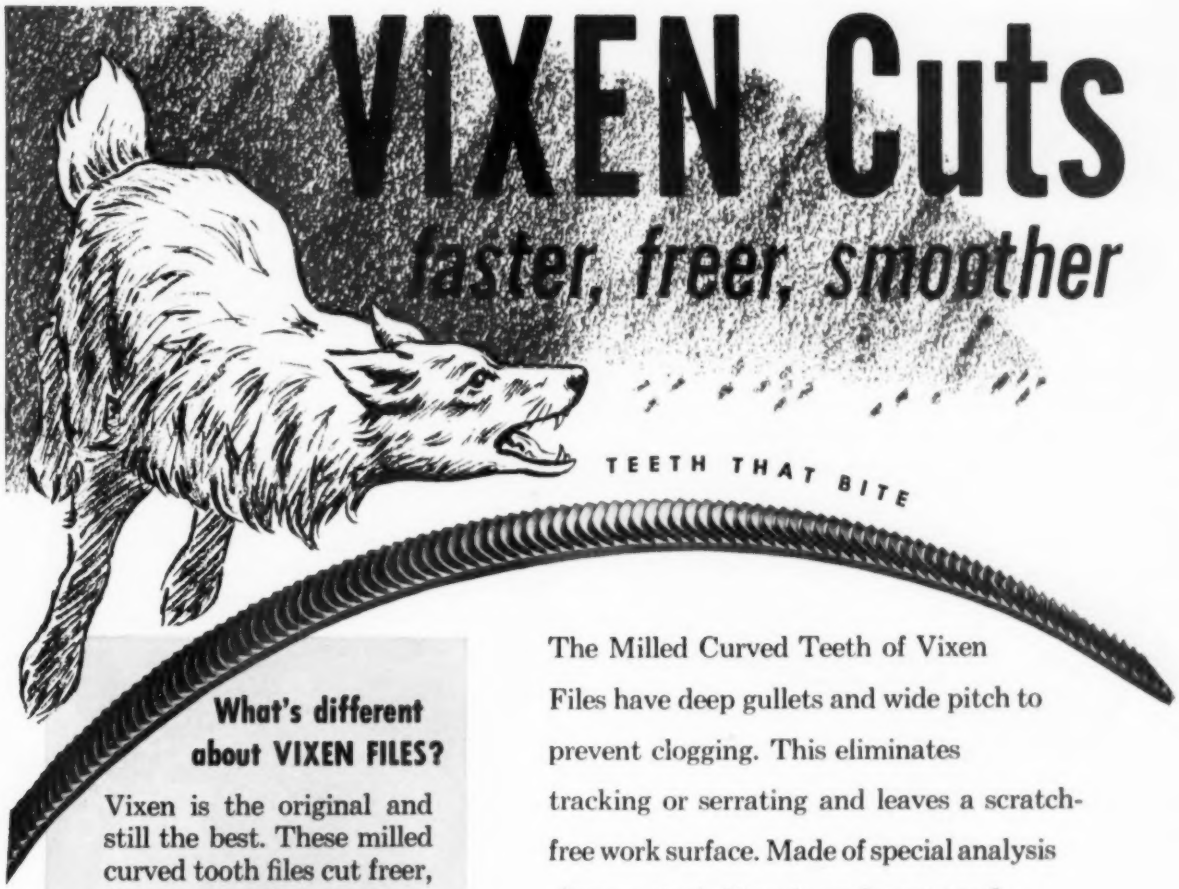
Broaching internal 1¼" I.D. spline on prop shaft tube coupling of SAE 4135 steel, this customer saved $699.60 on oil costs since changing to Antisep A.P. Base. One part Antisep to 20 parts plain water was used. Straight cutting oil formerly used cost 54c per gallon. User reports cleaner operation, too, with less handling of oil. In addition he reports, "We now get 1100 pieces per broach grind with Antisep, instead of the 600 our straight cutting fluid gave us!"

ANTISEP
ALL-PURPOSE BASE
—not a mere water soluble oil, but a fortified concentrate scientifically developed to give you "100 oils in one!"

E F HOUGHTON & CO.
PHILADELPHIA · CHICAGO · DETROIT · SAN FRANCISCO

Ready to give you on-the-job service . . .

VIXEN Cuts
faster, freer, smoother



What's different about VIXEN FILES?

Vixen is the original and still the best. These milled curved tooth files cut freer, faster, smoother because:

1. Milled curved teeth are actually miniature milling cutters.
2. Gullets are not pointed but rounded, to make chips fall free easier.
3. Undercut teeth have distinct cutting action, do not scrape or abrade.
4. Special analysis chrome steel keeps teeth sharp longer.
5. Vixens may be resharpened many times.

ASK YOUR HELLER DISTRIBUTOR FOR COMPLETE INFORMATION

The Milled Curved Teeth of Vixen Files have deep gullets and wide pitch to prevent clogging. This eliminates tracking or serrating and leaves a scratch-free work surface. Made of special analysis chrome steel, Vixen's undercut teeth remain keen longer. Vixens are available in all types of milled curved teeth files—a *complete* line.

THESE FAMOUS FILES ARE MADE ONLY BY

American-Swiss
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Only HELLER *make the Vixen*
the original and still the best
Milled Curved Tooth File

HELLER BROTHERS
SINCE 1836

SWANSON

V-LINER (PATENTED) INSPECTION UNIT

A new, universal inspection device which integrates all of the normal requirements of the Inspection Department

Saves

space, man-hours, tool investment.

BASIC UNIT INCLUDES: (1) a 60" surface plate; (2) an exclusive, concentricity checking attachment; (3) adjustable bench centers; (4) V-blocks; (5) sine plate; (6) indicator attachment. All are self-aligning and quickly adjustable or removable. Specifications and tolerances meet finest precision standards. Savings in space, man-hours and tool investment are substantial.

Write for Bulletin V-1

The V-Liner Inspection Unit incorporates, all of the skill, precision and experience gained by Swanson in more than a third of a century of designing and building special automatic machines. Swanson machines have reduced costs, increased output and improved precision in hundreds of manufacturing operations.

. . . other PRECISION PRODUCTS by SWANSON

V-Liner Concentricity Checking Fixtures
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Turret Index Units
Memory Devices for Automatic Machines
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TOOL & MACHINE PRODUCTS INC., ERIE, PA.

Quality since 1919

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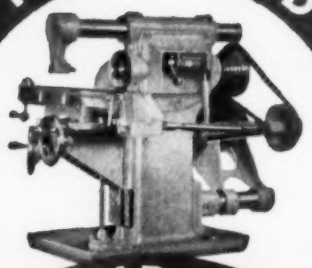
BURKE

FOR EVERY PURPOSE

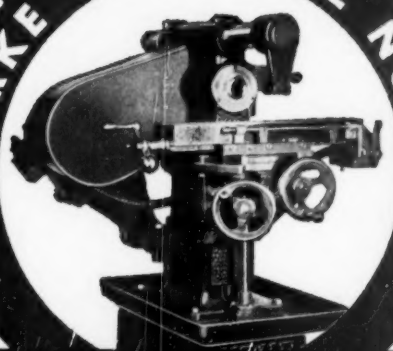
Thousands of efficient, low cost Burke Bench Millers are proving their superiority in Tool, Development and School Shops and a wide variety of mass production operations.

BURKE POWER FEED NO. 4



BURKE HAND FEED NO. 3

BURKE UNIVERSAL NO. 4



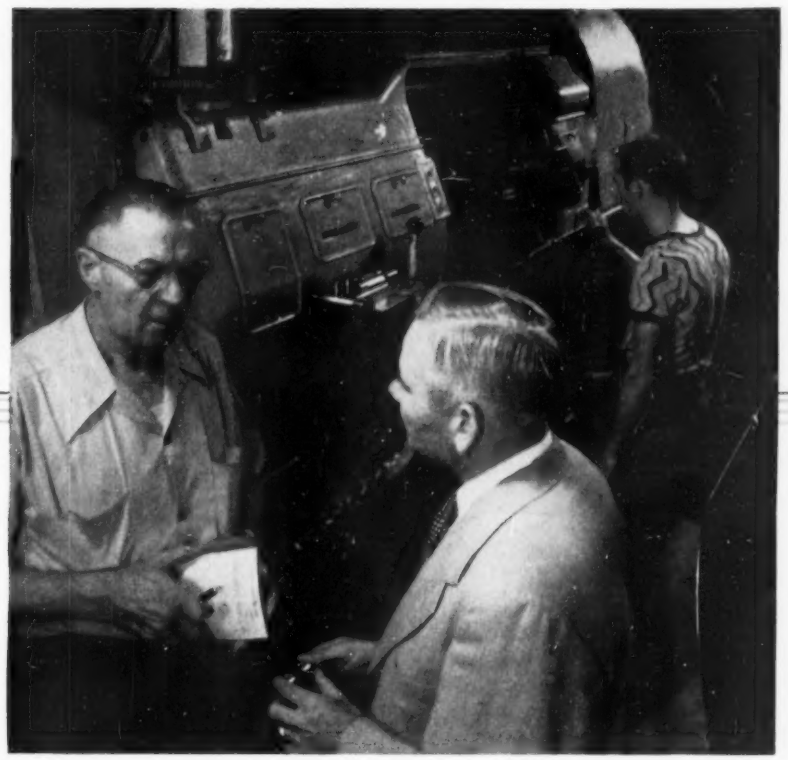
Send for complete data on models attachments, accessories and suggestions for putting Burke's to work for your profit.

THE U. S. - BURKE MACHINE TOOL DIV.

Brotherton Road 6, Cincinnati 27, Ohio

"with **GULF LASUPAR CUTTING OIL** we get better finishes, longer tool life on B-1113 steel parts"

says Guy Hack, Holt Products Co., Holt, Mich.



"Gulf Lasupar is the ideal cutting oil for high production-close tolerance work on automatics," says Mr. Hack. "Not only do we get longer tool life and better finishes, but we have found that this quality cutting oil provides corrosion-free lubrication of machine bearings."

Send the coupon below for a copy of the pamphlet "Gulf Lasupar Cutting Oil," which gives all the facts on how this outstanding cutting fluid can help you improve your machining practice.

GULF SERVES INDUSTRY

Gulf Oil Corporation · Gulf Refining Company
1822 Gulf Building, Pittsburgh 30, Pa. AM

Please send me, without obligation, a copy of your pamphlet, "Gulf Lasupar Cutting Oil."

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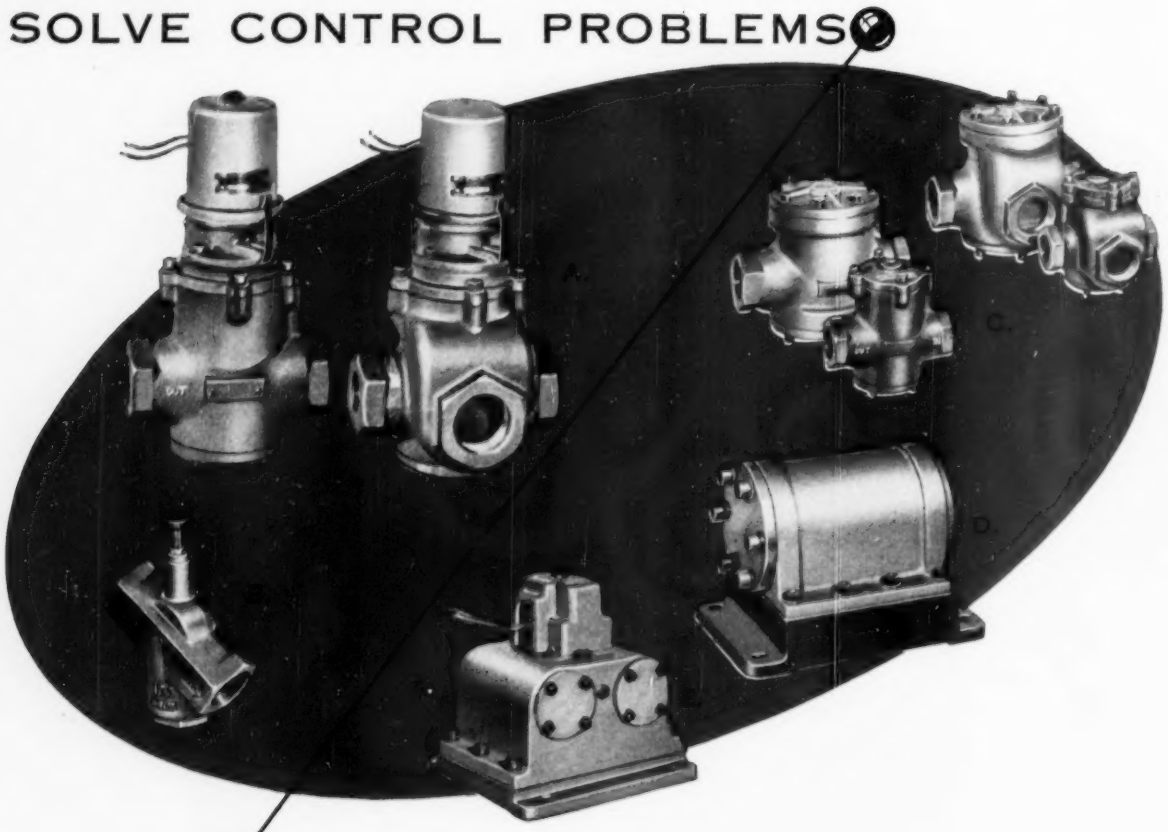
Company .....

Title .....

Address .....

BIG *Ross* VALVES
SOLVE CONTROL PROBLEMS



Ross makes hundreds of large valves for control of single or double acting cylinders on a wide variety of machines used in steel mills, foundries, press shops, processing industries, etc.

A. 700 Inline Series—solenoid controlled, pilot operated—straightway and three-way—normally open and normally closed—1 ¼" pipe.

B. Speed Control Valve—1 ¼" pipe.

C. 700 Inline Series—remote control—straightway and three-way—normally open and normally closed—1 ¼" and 2" pipe.

D. 700 Base Mounted Series—pilot pressure operated—three-way—normally closed—2" pipe.

E. 700 Base Mounted Series—solenoid controlled, pilot operated—four-way—1 ¼" pipe.

Ross has the most complete line of operating valves—large or small—in the industry. Ask Ross for any air control information.

Ross CONTROL

OPERATING VALVE COMPANY

104 E. GOLDEN GATE AVENUE • DETROIT 3 • MICHIGAN

New Thompson AUTOMATIC double wheel TRUFORM Grinder speeds jet engine production

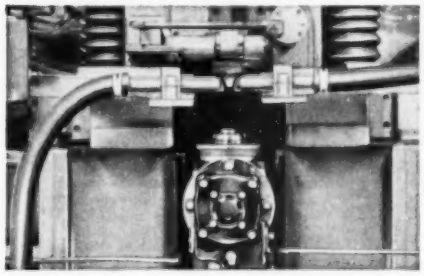
GRINDS BOTH SIDES OF JET TURBINE BUCKETS OR BLADES SIMULTANEOUSLY IN A SINGLE SETTING

To grind root sections on gas turbine buckets with greatest accuracy and productivity, Thompson developed this new AUTOMATIC double wheel TRUFORMING machine featuring simultaneous grinding of both sides of root section with one setting of work.

Grinds rough to finish in 110 seconds . . . or 30 buckets per hour

Hood doors, work clamps, coolant flow, grinding and crushing cycles are actuated in automatic sequence on the new Thompson AUTOMATIC double wheel TRUFORM Grinder.

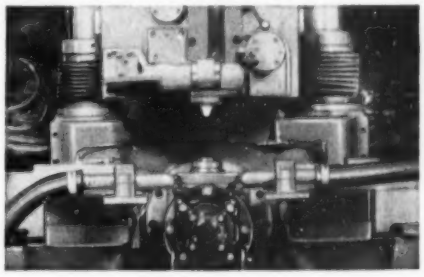
On a bucket having 2" length of form similar in design to the one in the diagram above with .150" stock removal per side from rough to finish size, production is 30 buckets per hour at a steady day after day rate. This includes down time for dressing, regrinding the crusher roll, initial machine warm up period, wheel changing and diamond changing. Actual machine time from rough forging or casting to finish is 104 seconds plus 6 seconds for loading and unloading time . . . makes total time floor to floor 110 seconds per piece.



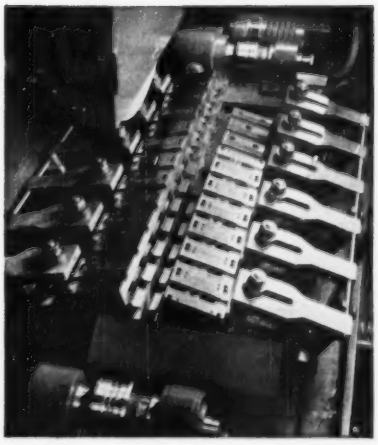
FOR ABSOLUTE SYMMETRY BOTH WHEELS ARE DRESSED FROM A SINGLE CRUSHER ROLL

◀ GRINDING POSITION

CRUSHING POSITION ▶

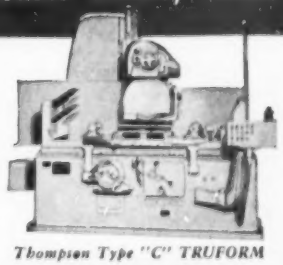


Standard THOMPSON TRUFORM Machines also grind jet buckets faster, better



By means of multiple grinding of jet turbine buckets the standard TRUFORM Grinders still offer high production plus many advantages such as flexibility of standard machine design and lower first cost. Although compared to the new AUTOMATIC the standard TRUFORM requires more skillful set up and tooling.

◀ **Typical tooling on Type "C" TRUFORM producing 24 buckets per hour. Type "B" TRUFORM produces 18 parts per hour.**

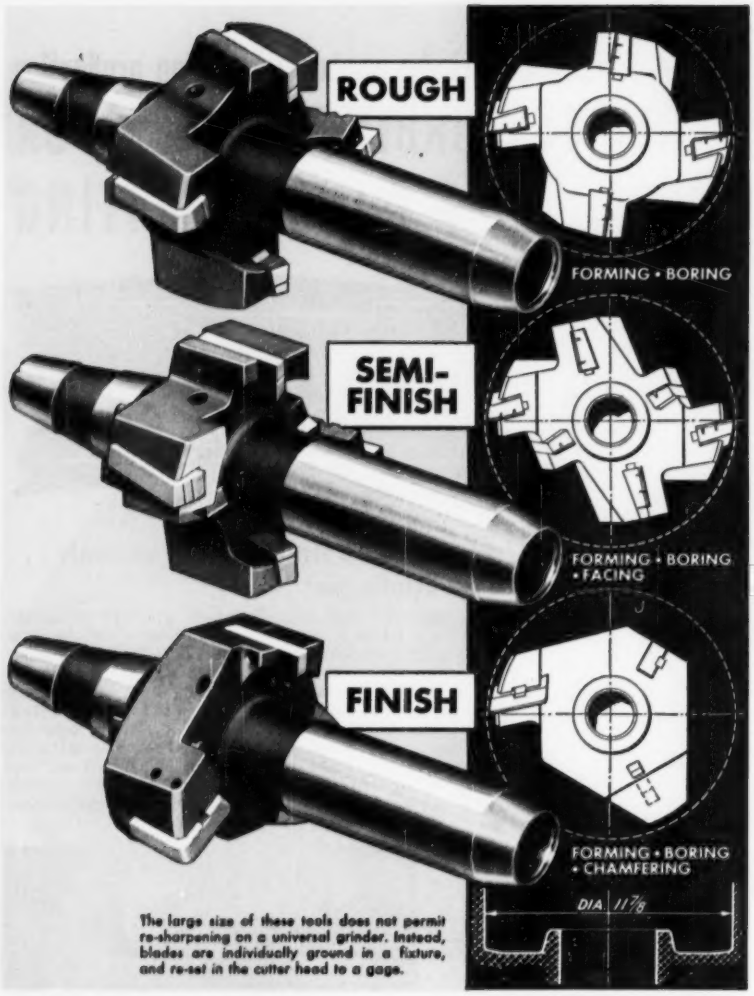


Thompson Type "C" TRUFORM

FOR COMPLETE DETAILS WRITE TODAY

The Thompson Grinder Co.
Springfield, Ohio

Thompson SURFACE Grinders



The large size of these tools does not permit re-sharpening on a universal grinder. Instead, blades are individually ground in a fixture, and re-set in the cutter head to a gage.

TOOLING by GAIRING

These large diameter special cutters see the job through from start to finish. Thousands of such multi-operation tools have been made by GAIRING in all sizes to solve various production problems • They range from large tools, shown here, to small cutters that may be held in standard counterbore holders. Send us your parts prints for a quotation on your requirements. Or ask our nearest representative to discuss any special or standard tools you may need.

In Canada: A. C. Wickman (Canada) Ltd., Queensway, Toronto 14

The GAIRING TOOL COMPANY • 21226 Hoover Road • Detroit 32, Michigan

Gas Fired FURNACES

No Blower or Power Needed FOR TEMPERATURES TO 2400° F.

Just connect the BUZZER High Speed Muffle Furnace to your gas supply and it is ready for use. A temperature of 2400° F. is attainable in approximately 1½ hours. Special block for controlled furnace atmospheres make this furnace particularly adaptable for high carbon and alloy steels. Special BUZZER burners have wide range of control.

Send today for catalog showing this furnace in bench and floor models, as well as other types of furnaces, burners and other equipment.

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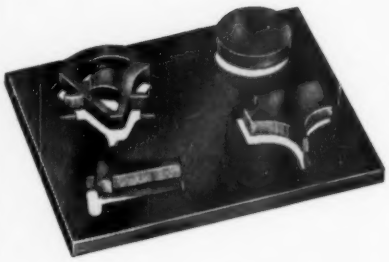
121 South Grand Avenue Baldwin, L. I., N. Y.

Atlantic CONTOUR BANDS



BUILT STRONGER- TO LAST LONGER!

Intricate curves call for more than a blade of flawless precision — complex contour cutting requires a band saw of lasting STAMINA! Teeth of maximum hardness . . . strong, yet flexible, stock . . . correct heat treating — all are essential in producing a contour band that not only cuts — *but keeps on cutting!* Atlantic saws are the production-increasing result of advanced design, materials and technical skills — Atlantic "extras" that payoff in production with more work per blade! . . slashed downtime! . . increased output! *Here is proof —*

Each tooth is scientifically heat treated from tip to gullet to a diamond-like hardness—an Atlantic assurance of a band of permanent set and durability. Atlantic's special analysis steel stock remains flexible! Blades are free from damaging checks and flaws — most costly blade breakage and crystallization is completely eliminated.

For 30 years Atlantic's facilities have been devoted exclusively to producing constantly improved blades. In the complete Atlantic line, there's a quality blade for every material, every job.

RAKER SET BANDS
An excellent blade for accurate, finished metal cutting.

WAVY SET BANDS
Slices bar stock, flat stock, tubing —whatever you want cut with new speed and economy.

SKIP TOOTH BANDS
The modern blade that cuts plastic, wood, soft metals with unrivaled efficiency and durability.

Send today for the graphic story of Atlantic's family of fine saws. If you have a specific saw application you are wondering about, include a brief description — it will meet interested engineering attention and be promptly acknowledged.

Atlantic
ATLANTIC SAW MFG. COMPANY, Inc.
BREWERY STREET

IN PLANT SPACE

AN ARROW-HART MOTOR CONTROL CENTER

CAN SAVE over 50% MORE

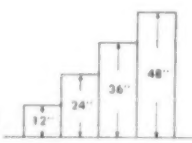
THAN ANY OTHER TYPE

For Example: BOTH OF THESE CONTROL CENTERS HOUSE 12 SIZE-2 REVERSING COMBINATION STARTERS

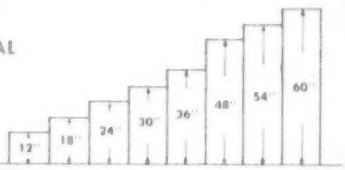
Because:

TO ACCOMMODATE ANY NON-REVERSING COMBINATION STARTER FROM SIZE 1 TO SIZE 5 OR ANY 2-SPEED OR REVERSING COMBINATION STARTER FROM SIZE 1 TO SIZE 3 . . .

AH CONTROL CENTERS REQUIRE JUST THESE **4** STANDARD UNIT COMPARTMENTS



. . . WHILE CONVENTIONAL CONTROL CENTERS REQUIRE THESE **8** STANDARD COMPARTMENTS



Unequalled Flexibility

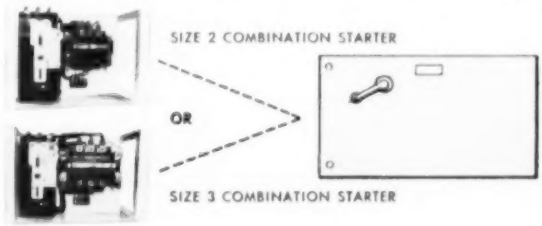
— Because Arrow-Hart Control Centers Expand Quickly, Easily To Meet Plant Growth

- All compartments are in multiples of 12" high, no odd sizes or waste space.
- Vacant compartments can be provided in laying out the initial Control Center installation.
- Any number of basic sections can be added as required; each accommodates up to six 12" high compartments.
- If machinery groups (or the entire plant) are moved to a new building, the Control Center can be moved without disturbing the internal wiring.
- Thanks to the much smaller size of exclusive A-H "Right Angle" Design Starters, ratings can be increased up to and including 30 H.P. without increasing the size of the compartment or the Control Center. Simply replace the original starter with a larger unit; for example . . .

Any One of These AH COMBINATION STARTERS

REVERSING and 2-SPEED SIZES 1 and 2 — **NON-REVERSING SIZES 1, 2 and 3**

CAN BE HOUSED IN THIS SINGLE 12" HIGH COMPARTMENT SIZE



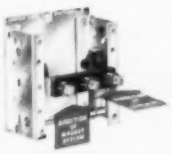
TURN THE PAGE FOR ADDITIONAL INFORMATION

THE ARROW AH HART MOTOR CONTROL CENTER

Special Features

EXCLUSIVE ARROW-HART "RIGHT ANGLE" STARTER DESIGN

The remarkable space savings possible with Arrow-Hart Control Centers are, in turn, made possible largely through the much smaller size and lighter weight of A-H "Right Angle" Starter Units. Basic in this revolutionary design is a completely different type of operating mechanism. Working through a bell crank lever, a much smaller magnet is able to outperform the old fashioned, direct-acting type. This first real advance in motor control design in over 20 years is now thoroughly tested, approved and acclaimed throughout industry. Here are some of its important benefits —



- **GREATLY REDUCED SIZE and WEIGHT**
- **STRAIGHT-THRU FRONT WIRING**
- **ALL PARTS EASILY ACCESSIBLE FROM FRONT**
- **VERTICAL CONTACT POSITION PREVENTS ACCUMULATION OF BREAKDOWN MATERIAL**
- **IMPROVED PERFORMANCE and DEPENDABILITY**
- **POSITIVE UNDERVOLTAGE RELEASE**
- **POSITIVE CONTACT ALIGNMENT**
- **SUPERIOR ARC SUPPRESSION with completely isolated individual arcing chambers**

A SAFE OPERATING HANDLE

The newly re-designed external handle mechanism assures safe operation at all times. The door cannot be opened unless the handle is turned to "OPEN" with the circuit breaker or disconnect switch in the safe "OFF" position.

To assure safe maintenance, the handle can be locked only in the "OFF" position, and provision is made for 3 padlocks. The circuit breaker is equipped with a truly self-aligning mechanism that aligns the handle with the actual position of the breaker when the door is closed.

TWO TYPES OF STARTER CONNECTION TO THE VERTICAL BUS

THE PERMANENT TYPE . . . utilizes wires from the Starter Units bolted to the vertical bus. Mounting depth is the same for both front mounting only and for back-to-back mounting.

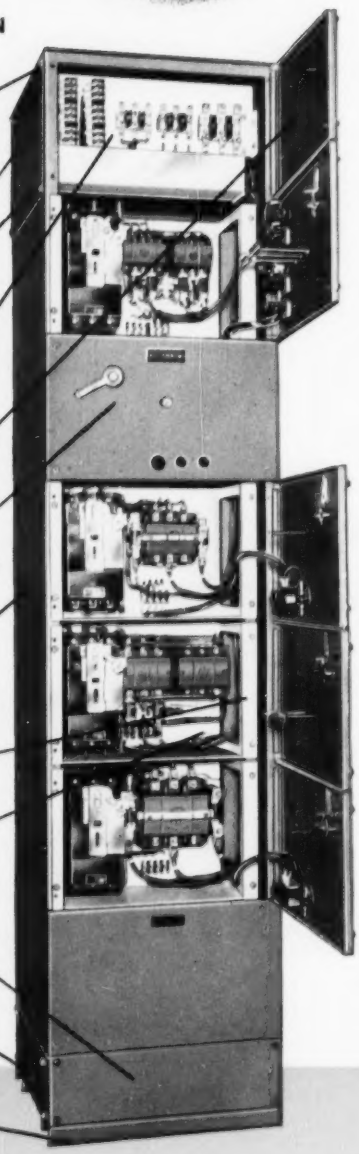
THE SELF-LOCKING "STAB" TYPE . . . utilizes Starter Units equipped with "Stabs" that "plug in" to the vertical bus. Starter Unit can be instantly and safely installed or removed while the bus is "hot" without shutting down the Control Center. Arrow-Hart Stabs provided with free-floating, self-aligning clips assure fast, positive, "no hunt" connections.

3 TYPES OF CONSTRUCTION

NEMA A, B or C

If Type C is specified, all wiring, interwiring and sequencing required for the complete Motor Control Center is completed at the factory, and a Wiring Diagram of the entire multi-unit Center is provided.

CONSTRUCTION FEATURES


FRONT or BACK-TO-BACK MOUNTING IN THE SAME 20" SPACE
HORIZONTAL BUS 600 or 800 Amp. Capacity
REMOVABLE TOP AND SIDE PLATES
MASTER TERMINAL BOARD and HORIZONTAL WIRING TROUGH
PAN SHAPED DOORS For Greater Rigidity
DUST TIGHT or WEATHER RESISTANT CONSTRUCTION ALSO AVAILABLE
VERTICAL BUS Flat for Permanent Connections, Rounded for Stab Type
CONVENIENT VERTICAL WIRING TROUGH
WHITE INTERIOR FINISH For Easy Visibility
REMOVABLE FRONT AND SIDE PLATES
WIRING SPACE IN BASE
REMOVABLE MOUNTING CHANNELS

No other MOTOR CONTROL CENTER *offers you*

- **SO MANY IMPORTANT FEATURES**
- **SUCH GREAT SAVINGS**
  In Plant Space — In Installation — In Maintenance
- **SO MANY ADVANTAGES**
  In Improved Performance — In Added Flexibility

Write Now FOR COMPLETE INFORMATION

Use handy coupon attached to send for your free copy of this Arrow-Hart Motor Control Center Bulletin.

INDUSTRIAL CONTROL DIVISION
THE ARROW-HART & HEGEMAN ELECTRIC CO.
103 Hawthorn Street, Hartford 6, Conn.

Please send my free copy of the Arrow-Hart Control Center Bulletin 170

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INDUSTRIAL CONTROL DIVISION

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HARTFORD 6, CONN., U.S.A.

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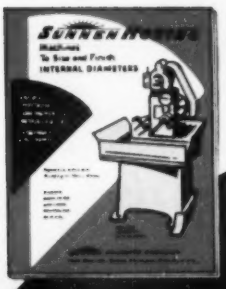
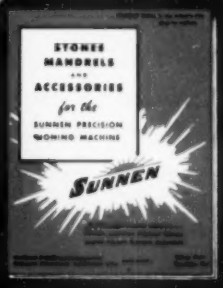
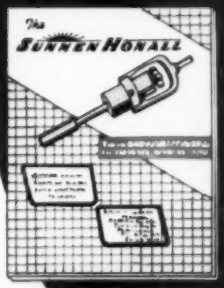


No. 50 Sunnen Honing Machines

No. 51 Sunnen Portable Cylinder Hones



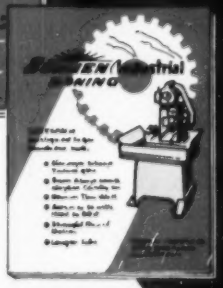
No. 505 Sunnen Honing Supplies & Accessories



No. 57 Sunnen Portable Honing

No. 55 Sunnen Tool Room Honing

No. 58 Sunnen External Hones



No. 60 Sunnen Honing Case Histories

SUNNEN® PRODUCTS CO.
7921 Manchester Avenue, Saint Louis 17, Missouri
Canadian Factory: Chatham, Ontario

These 7 FREE BOOKLETS Can Help You . . .

- ✓ Produce Accurate Internal Diameters
- ✓ Produce Accurate External Diameters
- ✓ Reduce Assembly Time
- ✓ Cut Production Costs on Internal Finishing
- ✓ Get Absolute Interchangeability of Parts with Precise Fits
- ✓ Get the Accuracy of Lapping in 1/5 the Time
- ✓ Eliminate Selective Fitting

SUNNEN® HONING Has Solved Such Problems For Hundreds of Other Companies . . . and may be the solution to some of your production headaches.

If your problem is how to meet newer, more exact specifications on bores and shafts, you'll want these booklets. They tell you how alert manufacturers are improving their products by honing . . . making them last longer and run smoother and cooler . . . making higher speeds permissible . . . all by using Sunnen Honing to produce smooth, accurate bushings and bores, as well as spindles, shafts, plungers and similar parts.

Use the coupon for your FREE booklets — no obligation.

7E2

To: SUNNEN PRODUCTS COMPANY, 7921 Manchester Ave., St. Louis 17, Mo.

☐ Please send me all 7 of the booklets.

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☐ No. 55 ☐ No. 58 ☐ No. 60

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Company.....

Address.....

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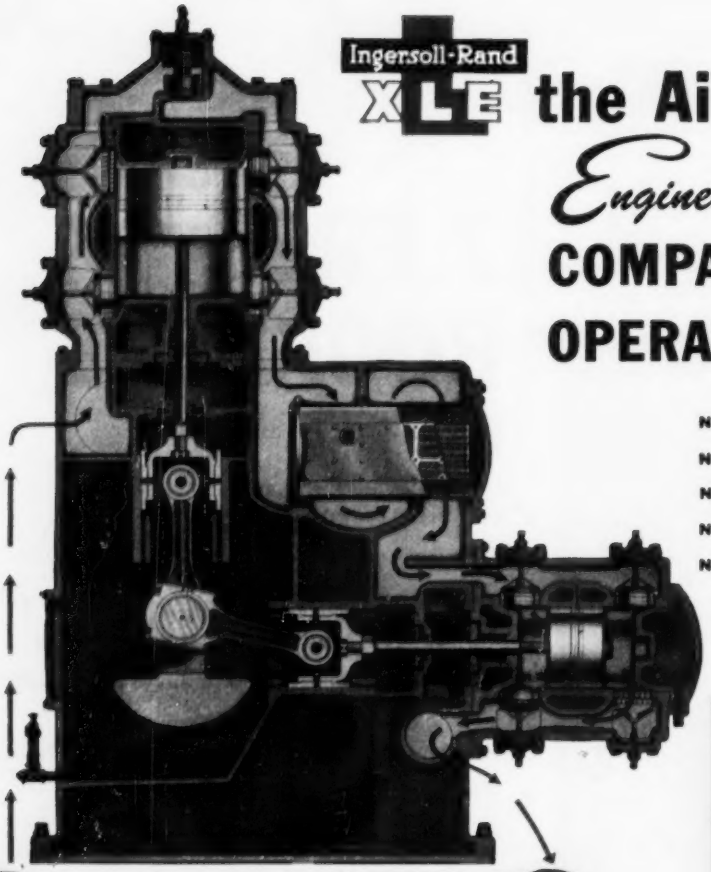
Ingersoll-Rand

XLE

the Air Compressor

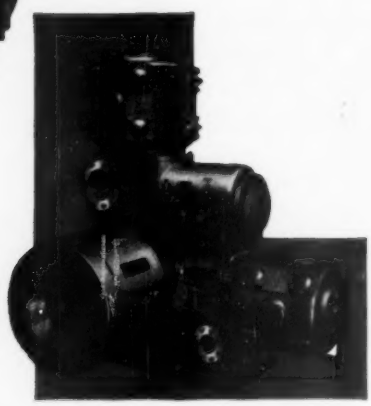
Engineered for COMPACTNESS AND OPERATING ECONOMY



NEW *Air Flow* DESIGN
NEW *Intercooler* DESIGN
NEW *Cylinder* DESIGN
NEW *Frame and Running Gear* DESIGN
NEW L DESIGN

PIPELESS THRU-FRAME AIR FLOW

Main air connections on the compressor frame eliminate piping strain from the cylinders. Air flow between these two points is entirely within the frame and cylinders. There is no interstage piping. The streamlined frame houses the intercooler and combined with the wide-flanged cylinders provides a sturdy construction that maintains alignment.



Packaged design for minimum floor space, and specially balanced for minimum foundation . . . ideal for skid-mounting.

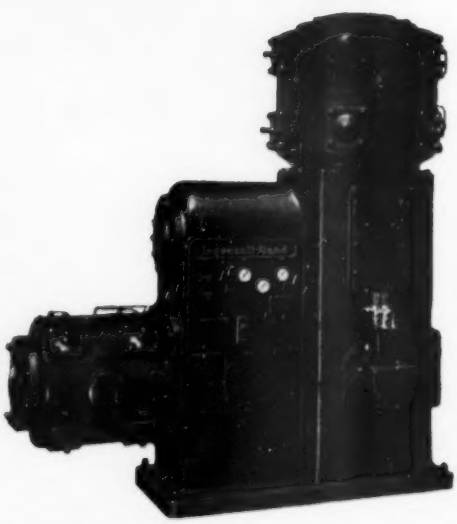
Easy to operate . . . push button starting, grouped controls, automatic force-feed lubrication, automatic condensate removal, automatic air-operated starting unloaders and capacity control.

Easy to install or relocate . . . ready-to-run, assembled shipment . . . simplified air and water piping.

Easy to maintain . . . simplified long-life construction . . . full-floating, cool-running, aluminum-alloy bearings that require no adjustment . . . no need to open the sealed crankcase which stays clean inside . . . streamlined exterior also easy to keep clean.

Low operating costs . . . new high-efficiency, long-life I-R Channel Valves result in compressor efficiency comparable to the largest units . . . durable, high-efficiency tube-and-fin intercooler saves water . . . efficient direct-connected motor.

Built for reliable, continuous full-load service . . . sizes 125, 150, 200, 250, 300, 350 horsepower . . . discharge pressures 80 to 125-psi, two stage . . . write for more information today.



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New
SKF Bulletin
Shows you how to get
Spherical Roller
Bearing capacity
Up 25% to 50%
life increased
2 to 3½ times...

Here, in a handy 12-page SKF Bulletin, is the information you need to take advantage of an SKF design improvement which

1. **Increases spherical roller bearing capacity 25% to 50%.**
2. **Increases service life 2 to 3½ times.**
3. **Carries heavier combined radial and thrust loads, or pure thrust loads of greater magnitude.**
4. **Is fully self-aligning.**

SKF *originated* the spherical roller bearing; now, again, the same pioneering kind of engineering provides industry with another important anti-friction first. This latest advance has been thoroughly proved over an extensive period in such applications as railroad journals, vibrating screens, steel mill machinery and other hard-service locations.

Send for your free copy of Bulletin No. 365-6 which gives complete facts—sizes available—increased life you can expect for each size. And remember that a Sales Engineer in any SKF District Office can and will help you make the best use of it.

SKF INDUSTRIES, INC., PHILADELPHIA 32, PA.
—manufacturers of **SKF** *and* HESS-BRIGHT *bearings.*

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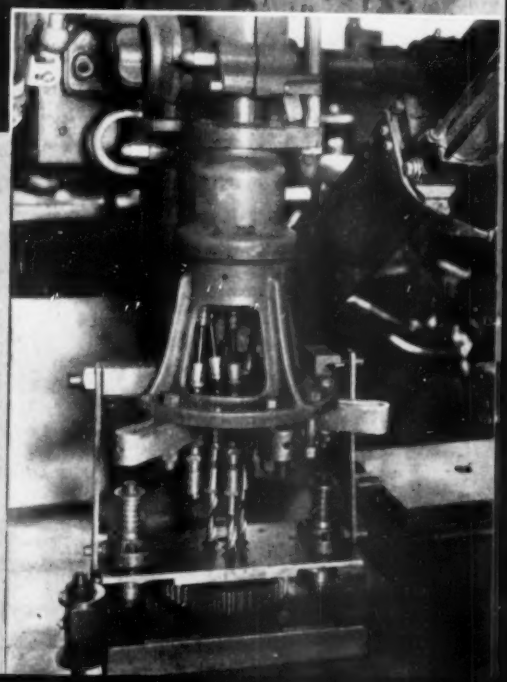
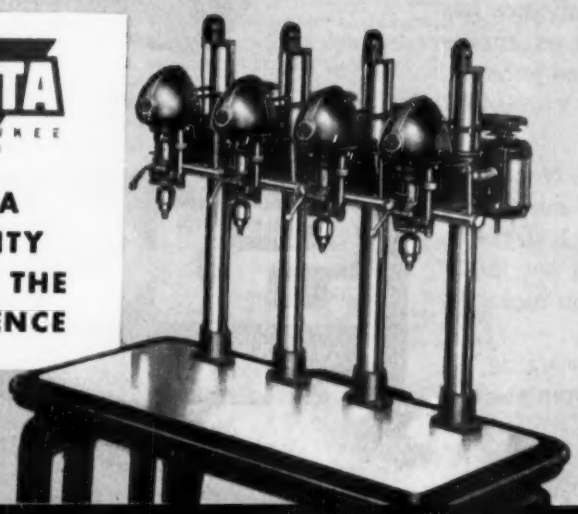
SKF®
BALL AND ROLLER BEARINGS

Our Production Jumped



DELTA
MILWAUKEE

DELTA QUALITY MAKES THE DIFFERENCE



300% with our First

DELTA Drill Press

says CHARLES LASLO, Superintendent, CLOYES GEAR WORKS, Cleveland, Ohio

4-spindle 14" drill press drills 4 to 6 holes at one time in timing gears—Chamfering is free operation—Machine used 30-40 hours per week, maintenance negligible.

- ***Another example of improved direct labor efficiency by using DELTA tools***

"In our pre-Delta era," says Mr. Laslo, "we used a 4-spindle drilling machine with flat-belt drive to drill and chamfer holes in timing gears used by leading auto builders. Belt slippage lost a lot of production and belt maintenance was high. Pieces were held by hand, and precision tolerances were hard to maintain.

"We bought a Delta 4-spindle, 14" drill press to do the combined drilling and chamfering operation on the gears. The No. 1 spindle was equipped with a fixture to hold the work, a multiple spindle head to do all the drilling, and a power feed.

"Chamfering became a 'free' operation because, while the No. 1 spindle goes through its automatic cycle, the operator chamfers the already-drilled piece from the previous cycle, puts it in the finished stock box, and gets a new piece ready.

"These operations are absolutely cost-free from a labor standpoint—compared with the old method.

"Also when time studies on one product proved that handling operations accounted for ⅓ of total cost, we installed another Delta single-spindle 14" drill press mounted on a wheel-equipped table. By moving the tool we eliminated most of the moving of the work.

"Recently, to deal with heavier volume we bought a Delta 17" drill press that drills 1/16" and 27/64" holes with extraordinary efficiency and accuracy."

Results speak for themselves:

- **Quality greatly improved—fewer rejects**
- **Operations eliminated**
- ***Production quadrupled***

Thousands of other Delta users are getting the same labor savings from multiple set ups that include the Delta 17" power feed drill press.

Can you win new "highs" in volume and quality? —most likely, yes! It's surely worth a little no-cost exploration. Talk to your Delta dealer—listed in the classified pages of your phone book under "Tools" or "Machinery"; and use the coupon to get the latest Delta AB-52 Catalog.

DELTA QUALITY POWER TOOLS

Another Product of **Rockwell**

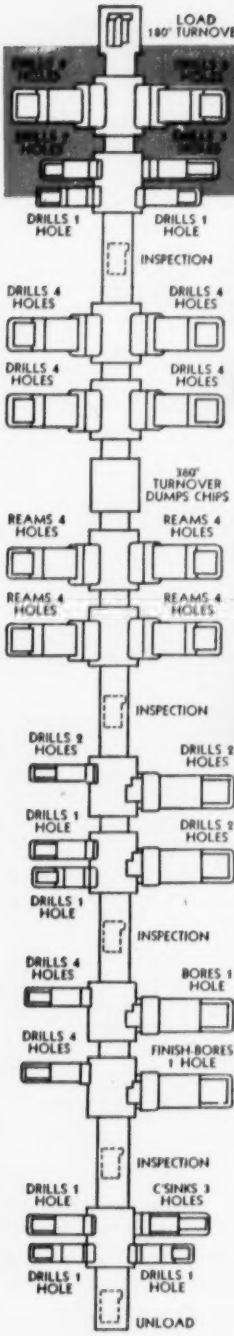
Delta Power Tool Division
Rockwell Manufacturing Company
618M N. Lexington Ave., Pittsburgh 8, Pa.

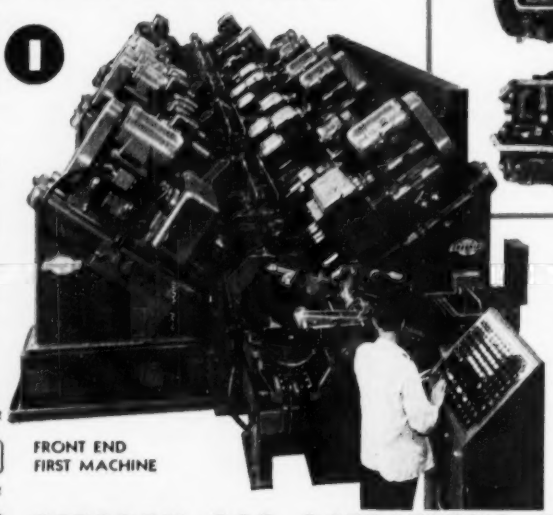
( ) Please send me the name of my nearest Delta dealer
( ) Please send me the latest AB-52 catalog

Name_____
Position_____
Company_____
Street_____
City_____ Zone____ State____

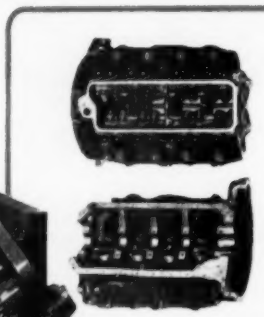
GREENLEE

TRANSFER MACHINES

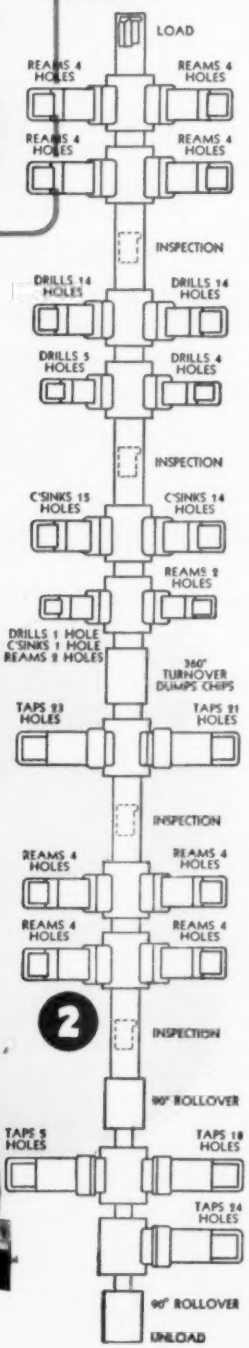




FRONT END
FIRST MACHINE



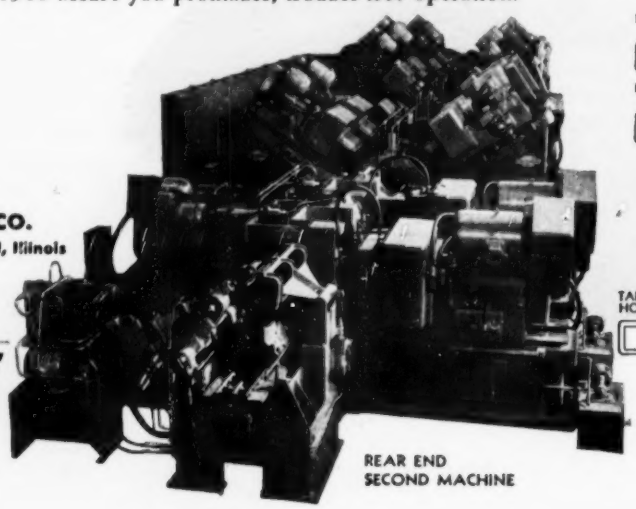
NEW V-8 BLOCKS



PERFORM 289 OPERATIONS ON V-8 CYLINDER BLOCKS AT 75 BLOCKS PER HOUR

New tooling for a brand new V-8 motor includes three lines of Greenlee Automatic Transfer Machines similar to the units illustrated. Each 2-machine line performs 289 operations on cylinder blocks during a 45-second cycle.

Sound construction, proved engineering, and a background of experience in building special machinery that dates back to 1918 assure you profitable, trouble-free operation.



REAR END
SECOND MACHINE

GREENLEE BROS. & CO.
1732 Mason Ave., Rockford, Illinois

PRODUCTION MACHINERY
GREENLEE

employees with seniority rights

are requesting (and getting!) these* **LAPOINTE** *Broaching Machines assigned to them, with the*

exclusive **LAPOINTE**

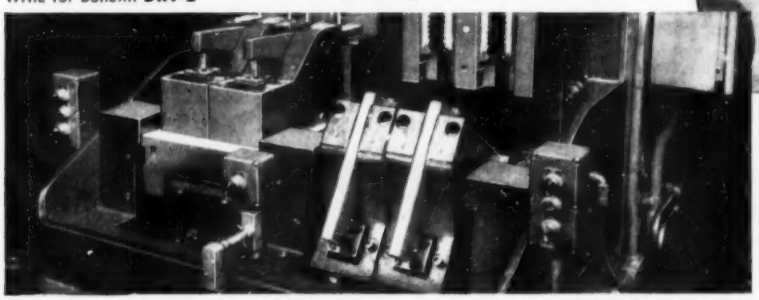
DOUBLE TIP-DOWN FIXTURE

why? *Because they have found these machines so convenient for part handling!*

Here are the reasons: *Fixture tilts down toward the operator*

. . . for safe and convenient handling of parts
. . . in the most natural position
. . . into inclined, unobstructed work nests
. . . already visible and easily accessible *without reaching across the machine!*

Write for Bulletin **DRV-2**



The **LAPOINTE** Double Tip-Down Fixture operates hydraulically and is electrically interlocked in synchronism with the travel of the broach assemblies, cutting on one ram while the other ram is being loaded.

Straddle broaching the sides of **Automotive Connecting Rod Cap,** removing a maximum of 1/8" of stock per surface from the forging . . . with the **LAPOINTE** 10-ton, 42-inch stroke Double Ram Vertical Surface Broaching Machine. With this machine, even a green operator who had never before run a machine was able to produce 750 parts per hour!

*An actual case! (Name on request.)

LAPOINTE

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

150 SQ. IN. OF WORK SURFACE

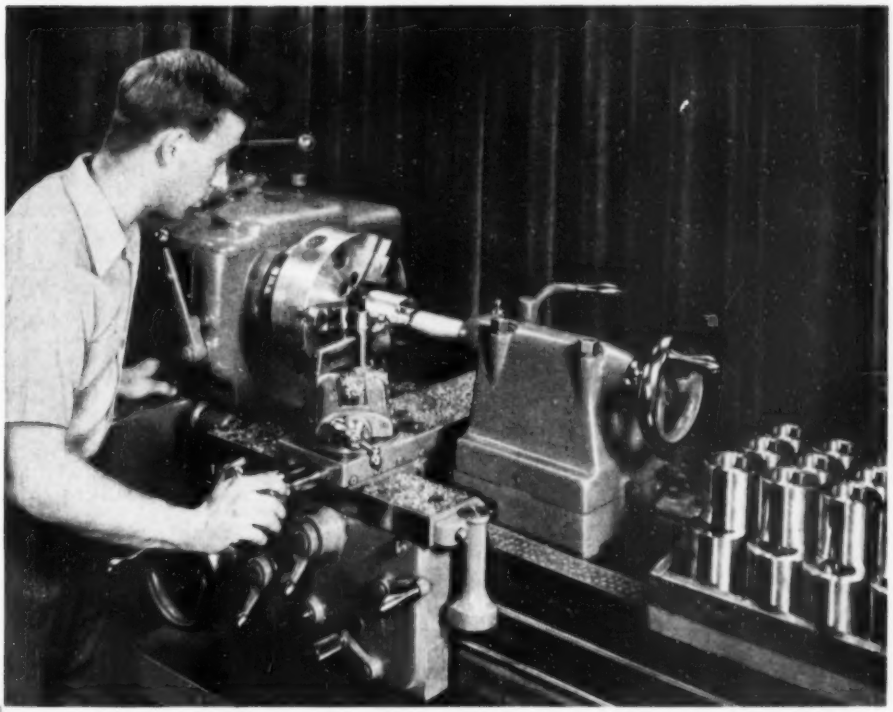
ABRASIVE NO. 1½ TOOLROOM SURFACE GRINDER—a quality-built hand feed grinder—has the capacity your toolmakers need for their work—nearly 50% more than most small surface grinders. Abrasive No. 1½ is easy to work with—it's a big favorite with toolmakers throughout the world. Thousands of these simple, efficient grinders are in service today—in tool and die shops, and in the tool departments of production plants. Send for Catalog giving complete details. Abrasive Machine Tool Company, 8 Dunellen Road, East Providence 14, R. I.

ABRASIVE
ACCURACY BOOSTS PRODUCTION

Abrasive Quality is Reflected in the Finish of Your Product

PRECISION PRODUCTION

with ROCKFORD ECONOMY LATHES



MEDIUM-SIZED

ECONOMY-PRICED

Big Accurate Lead Screw

Independent Feed Shaft

Precision Timken Bearing Spindle

Heavy Tail Stock, Anti-Friction Thrust Bearings

Hobbed and Shaved Headstock Gears

Tool Room Accuracy, Zero Precision Bearings

All-Geared Head, Quad-V-Belt Drive

Heavy Cuts, 16" or 18" Swing, 30" Center Distance

6' Bed, Double Wall Apron, 3100 lbs. Total Weight

With these features Rockford Lathes offer you either Tool Room or High Production operation, with modern design, ample dimensions and high quality materials.

Ask a Rockford Machine Tool Representative to give you full details on the practical production advantages of these heavy service, medium sized, economy priced machines.

ROCKFORD ECONOMY LATHES—16" and 18"

ROCKFORD MACHINE TOOL CO.

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How to Control SHOP COSTS

Skillful control of all operations involved in developing, manufacturing, and marketing the products of your company bears strongly on your company's profit situation.

This *American Machinist* Special Report describes methods of controlling manufacturing costs that can be applied in jobbing as well as production shops. Basic concepts of common costing methods are examined, and emphasis is given the fundamentals upon which all systems must be based to produce accurate operating figures.

Numerous graphs, charts, and reproductions of the many operating reports required add to the helpfulness of this fifteen-page report by Albert E. Grover, Cost Consultant.

25 cents a copy

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From the *American Machinist* Library of *Tips for Top Shop Men*

DON'T put a worried man on a critical job. If safety is a function of flowless timing, the man with something else on his mind is accident prone. Give him a safe job for a while, until his sorrow, illness, financial ailments, or mental scramble can straighten itself out.

TIGHTEN YOUR GRIP ON PRODUCTION

Production flows faster and smoother when your machine tools are equipped with Jacobs Chucks.

Rugged construction, great gripping power and accuracy have made The Jacobs Plain Bearing Drill Chuck the choice of machinists throughout the world.

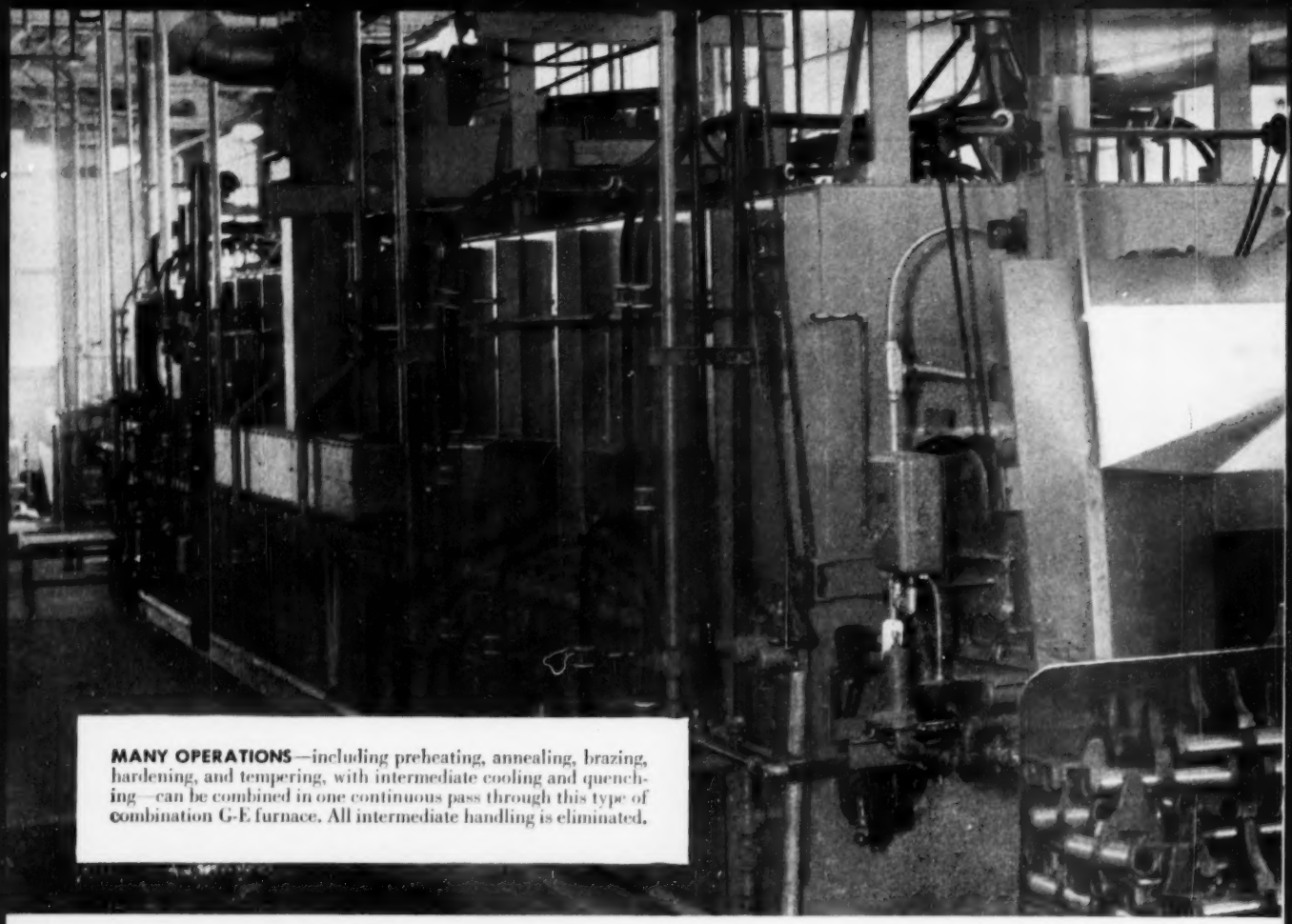
The Jacobs Manufacturing Company, West Hartford 10, Connecticut.

IF IT'S A JACOBS IT HOLDS

Jacobs and your local distributor

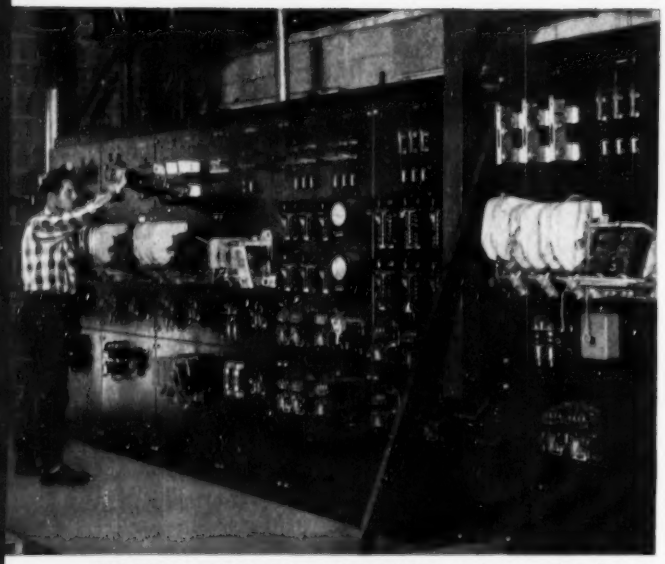
are ready to deliver the chucks you need and the service you deserve.

. . . first in chucks
. . . first in service

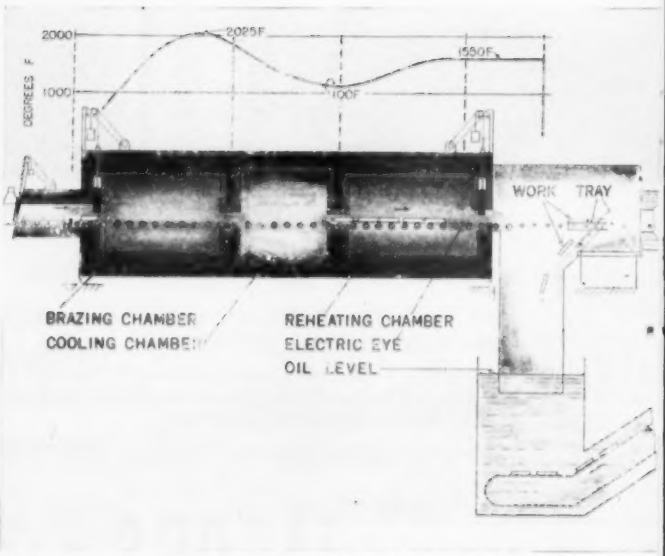


MANY OPERATIONS—including preheating, annealing, brazing, hardening, and tempering, with intermediate cooling and quenching—can be combined in one continuous pass through this type of combination G-E furnace. All intermediate handling is eliminated.

Production Increased Five Times



AUTOMATIC CONTROL AND TIMING of the complete heating cycle is provided by this G-E control panel. After heating pattern is set, panel supervision is not necessary, and uniform, high-quality heat treatment of parts is assured.



LONGITUDINAL SECTION VIEW of G-E roller-hearth furnace shows how assemblies pass through furnace during heat treatment. Straight-line heat treating like this simplifies furnace operation, and provides fast production and low handling costs.

with G-E "Combination" Furnaces

Burgess-Norton Combines Brazing And Hardening In One Furnace

"By combining brazing and heat treating of tank-track links in G-E roller-hearth, combination-type furnaces, we increased the production per furnace five times without adding any new personnel," reports Burgess-Norton Mfg. Co., Geneva, Ill.

In addition, this former user of batch-type, box furnaces has improved product quality, conserved production floor space, and substantially reduced costs by eliminating many handling operations.

Automatic operation of this G-E furnace reduces handling to merely loading and unloading the assemblies. No intermediate handling of work between brazing and heat treating is required because parts are brazed, partially cooled, reheated, and quenched for hardening in one continuous pass through the furnace.

Improved product quality and fewer rejects are assured because electric furnaces provide uniform heating of every part. Product inspection time is reduced because low-cost, G-E protective atmospheres prevent scaling. Parts emerge from the furnace bright and shiny requiring only a fast, visual examination.

You can reduce your over-all heating costs with these "combination" furnaces designed to meet the needs of a wide variety of metal-processing operations, including preheating, annealing, brazing, hardening, normalizing, or tempering. For more information, contact your nearest G-E Apparatus Sales representative.

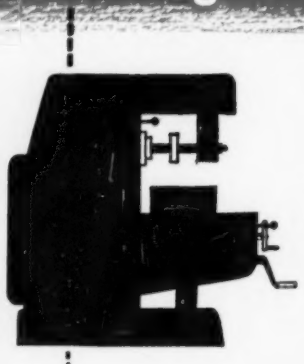
GENERAL ELECTRIC

WRITE NOW FOR THESE MODERN METAL PROCESSING BULLETINS

- Furnace and Induction Brazing, GEA-5889
- Annealing Malleable Iron, GEA-5797
- Heat-treating Aluminum, GEA-5912

Address: General Electric Co., Sect. 720-119, Schenectady 5, N. Y.

production begins with



Columbus Die-Tool

No tools like the right tools! Columbus Die-Tool designs and builds tools, jigs, fixtures and special machinery to meet your most exacting requirements. RESULTS: operating cost that matches your budget; production that matches your schedule; product quality that matches the demands of your market.

Contact Columbus Die-Tool & Machine Co. first—when you have a special machine problem. They are nationally known as expert designers and builders of special machinery and equipment . . . have been for over 46 years.

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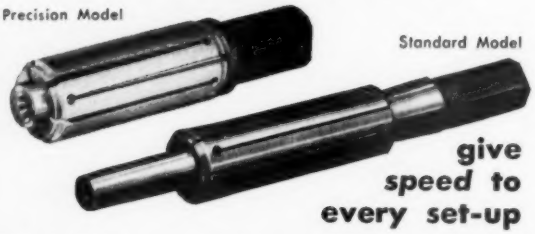
SPECIAL TOOLS • UNITS FOR MACHINE TOOLS

CHAMPION
E-X-P-A-N-D-I-N-G
MANDRELS

Precision Model



Standard Model

give speed to every set-up

The flexible sleeve, mounted on tapered arbor, expands automatically to fit the hole. Inserted by hand — no arbor press needed. Always an exact, positive, concentric fit. Locked by a single mallet blow. Unlocked the same way. CHAMPION Expanding Mandrels are used in machine shops around the world. Save time, cut production costs, whether the job calls for machining one piece or a thousand.

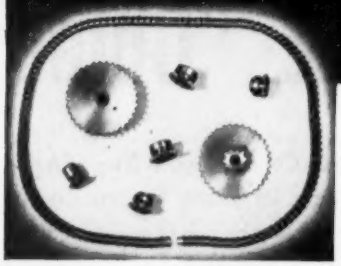
Precision Model has expansion range of .010". Available in regular sizes to fit holes from ⅛" to 3" diam. Holds work to tolerances of .0002" run-out. Guaranteed for precision grinding, turning and milling operations.

Standard Model maintains close tolerances, handles material of any length bore, hard or soft metals — from thin tubes and bushings to heavy castings and forgings. A set of fourteen will fit every hole from ½" to 9½" diam.

CHAMPION *Expanding Mandrels can be made in special shapes and sizes to fit any specifications. Quotations on request. Write for descriptive folder today.*

WESTERN TOOL & MFG. CO., INC.
Dept. 24 Springfield, Ohio

Rugged Winzeler Sprockets Help Drive the B.V.I. Sander



Winzeler Ladder Chain Stamped Sprockets bring smooth, dependable performance, long life and *low cost* to the excellent Burgess Belt Sander. Built for toughest sanding jobs, the BVI uses only the sturdiest components.

Cut your costs . . improve quality and performance . . get the uniformity and accuracy only *Winzeler* Stamped Gears can give. Stock and custom dies. Assemblies by staking, brazing, riveting. Production runs on modern high speed equipment assure deliveries *on time!*

***WRITE FOR FREE** folder describing our facilities, tools, assemblies and various Stamped Gears. Includes data and tables. Get samples, ideas, and low prices.*

WINZELER Stamped Gears

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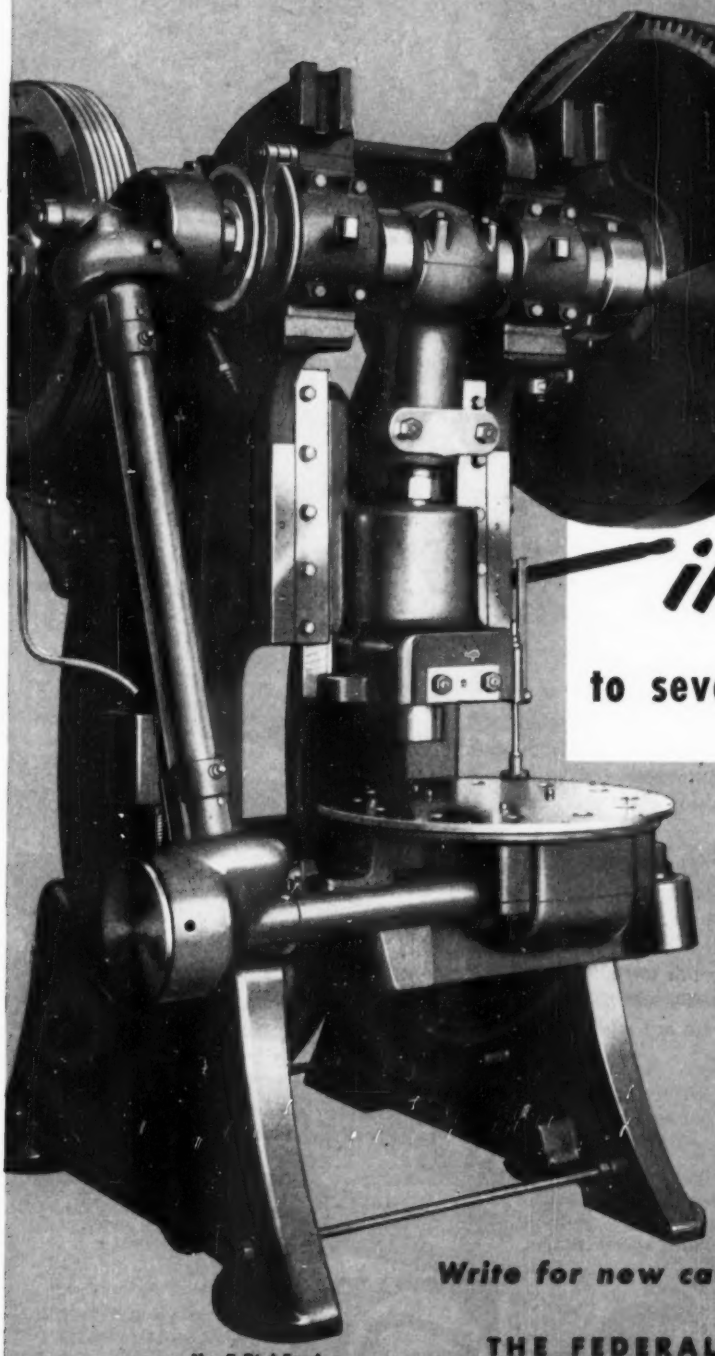
1712 WEST ARCADE PLACE, CHICAGO 12, ILLINOIS

FEDERAL DIAL FEED PRESSES

28 YEARS OF QUALITY CONSTRUCTION



Equal in output—

to several standard presses!

Often you will find a *single* Federal Dial Feed doing the work of three to five standard presses! Automatic loading and ejector mechanisms provide still further economies. Rugged, precision-built Federals are setting new highs in faster, safer, precision work—cutting down-time, reducing accidents, eliminating more expensive equipment. Finest materials and workmanship. Six to 80 tons. Also standard presses.

Write for new catalog!

No. 7 Dial Feed
Capacity, 80 tons

THE FEDERAL PRESS COMPANY
501 DIVISION ST., ELKHART, INDIANA

No. 2E general purpose precision lathe WITH ELECTRONIC MOTOR CONTROL

Hendey, pioneer in "quality," introduces another *first* — a new 14″ precision general purpose lathe with infinitely variable spindle speed control to 1500 R.P.M. Because of this outstanding feature the No. 2E offers broad opportunities to increase efficiency and lower turning costs, with operator effort reduced to a minimum.

Effortless control by one convenient fingertip selector smoothly adjusts spindle speeds through the full range from 15 to 1500 R.P.M. Adjust under cut or pre-set to the most efficient speed . . . it's that simple. The Hendey proved electronic control of the drive motor takes over the effort . . . responds to the operator's every spindle speed requirement. Instantaneous electric dynamic spindle braking plus start, stop, and reverse are one-lever controlled at the headstock and apron.

Add to this . . . induction hardened and precision ground bedways . . . reverse to the lead screw . . . automatic lubrication . . . 48 feed and thread changes . . . sturdy V-type cross ribbed bed . . . convenient grouping of operating controls . . . plus traditional Hendey built-in quality and precision.

Write for detailed specifications.

the Hendey machine co., inc.
torrington, conn., u.s.a.
——precision machine tools——

HENDEY

distributors in principal cities

Could you duplicate these OK hardened ways?

Here are only a few of the wide variety of shapes made possible by OK 3-point advantage:

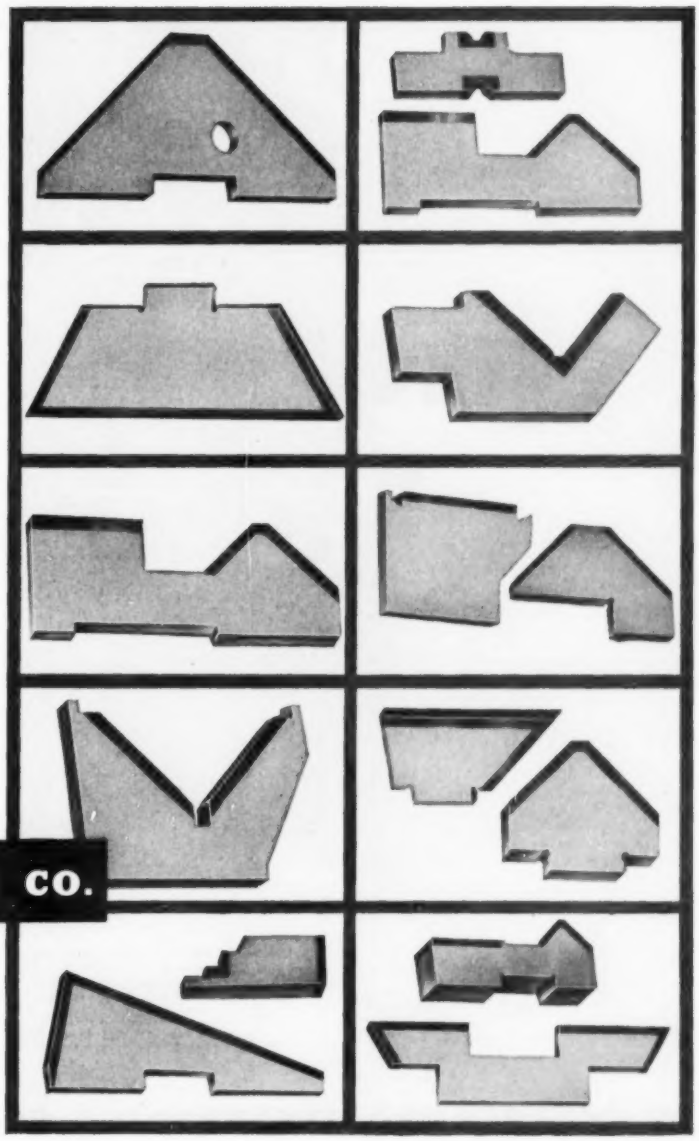
1. LAMINATED CONSTRUCTION Through Ohio Knife's own process, long-wearing tool steel is welded to a soft steel backing under 2500 tons pressure. This process enables us to deliver ways answering any requirement for hardness, regardless of the shape of the way.

2. SPECIAL HEAT-TREATMENT OK ways' extreme hardness (65-66 Rockwell "C") to a uniform depth is a key factor in successful performance regardless of shape.

3. PRECISION EQUIPMENT Ohio Knife has the extensive plant facilities and equipment required for supreme accuracy. OK hardened ways and gibs are ground to tolerances of ± .0002.

Besides a wide range of standard sizes and shapes, OK ways are made to your specifications.

Write for comprehensive Bulletin to Dept. W.



THE OHIO KNIFE CO.

CINCINNATI 23, OHIO

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The CECO-DROP makes other gravity drop hammers obsolete

Builders of THE IMPACTER

"FORGING IN MID-AIR"

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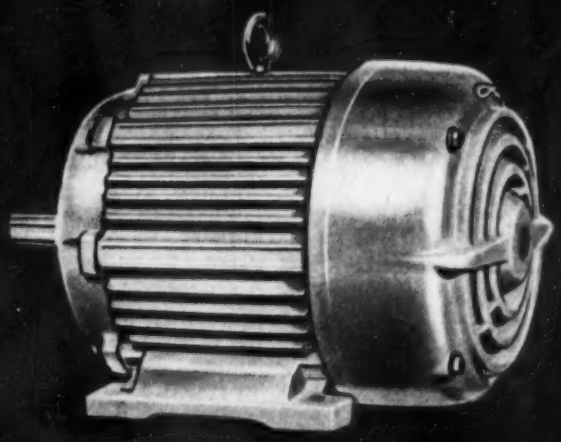


Here's new power for all standard and special motor applications

The Louis Allis Co. proudly presents the NEW L.A. *Line of electric motors*

Upper: New L.A. Fan-cooled and Explosion-proof Motor

New L.A. Open, Drip-proof Motor

Here is complete utilization of more than 50 years of motor engineering and development—the new L.A. line of electric motors. More than just a "face-lifting" to meet the new NEMA standards, these motors are entirely new through and through—with such features as new modern styling . . . improved ventilation . . . greater motor protection . . . new conduit box arrangement . . . new bearing construction . . . and more versatile mounting.

Improvements in motor design, materials, and manufacturing methods make the new L.A. line possible. These motors pack more power in a smaller, lighter, more functional package. Yet they sacrifice none of the high Louis Allis standards of performance and liberal design.

Get the facts on the most modern motors available—the new L.A. line. Call in your nearby Louis Allis Sales Engineer today for the complete story.

Special Note *Louis Allis motors in old NEMA standard frame sizes will still be available if you require them for interchangeability or replacement.*

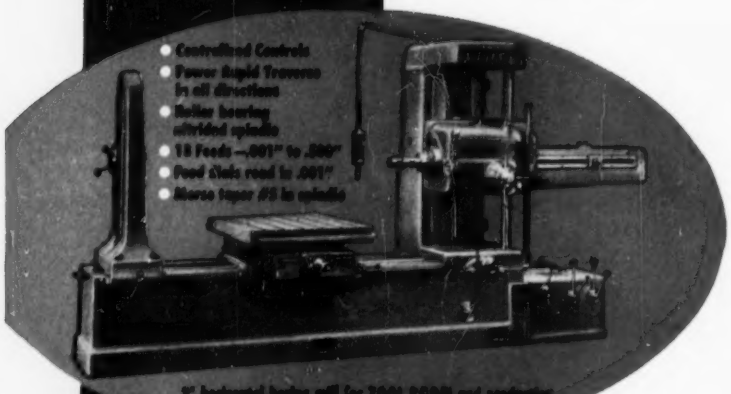
THE LOUIS ALLIS CO. • MILWAUKEE 7, WISCONSIN

immediate delivery

3" horizontal boring mill for TOOL ROOM and production

table top swivels full 360°

18 speeds—17 to 910 r.p.m.



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over 75 years of "know-how" in the manufacture of precision production machinery

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Simplicity of design permits an unusually low price. Parker Machine Company has these mills on hand for immediate delivery. Write or phone John Schleiffer at our Brooklyn headquarters for full information.

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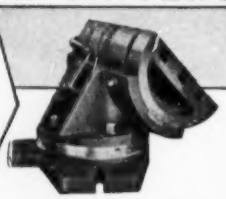
A Precision Tool that Holds Work at Any Desired Angle.



Puts Speed and Profit into Angular Drilling, Milling, Planing, Shaping, Grinding

With a Boston Universal Angle Plate on the job, work is quickly set up on the table and but a few seconds are required to locate it at the desired angle. Indispensable in tool rooms and extremely useful in production runs, the Boston Universal pays for itself many times over by eliminating the necessity of expensive jigs and fixtures.

Horizontal motion is 360 degrees; vertical motion, 120 degrees. Fitted with vernier scale reading to 5 minutes.

Made in several stock sizes.

Write today for full information.

US AUTOMATIC BOX MACHINERY CO., Inc.
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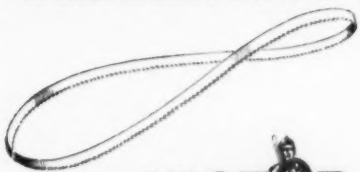
Cutting by hand?

Cutting by power?

Cutting with bandsaws?



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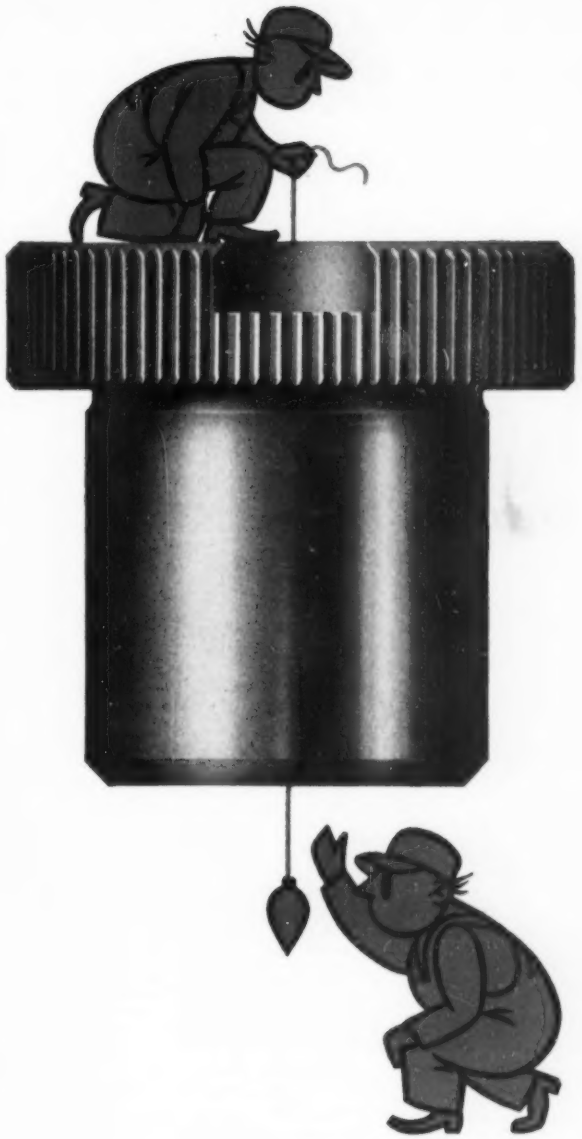

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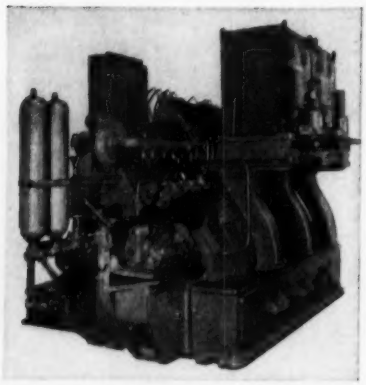
UNIVERSAL ENGINEERING COMPANY

FRANKENMUTH 1
MICHIGAN

1	STANDARD COLLET CHUCK
2	FLOATING COLLET CHUCK
3	BORING CHUCK
4	"KWIK-SWITCH" TOOL HOLDER
5	MIKRO-LOK BORING BAR
6	STANDARD DRILL BUSHING
7	UNIVERSAL INDEX PLUNGER

How Greer Accumulators Improve Performance Reduce Size and Cost of Hydraulic Equipment

Ingenious Power Package Lets Small Motors Do the Work of Big Ones

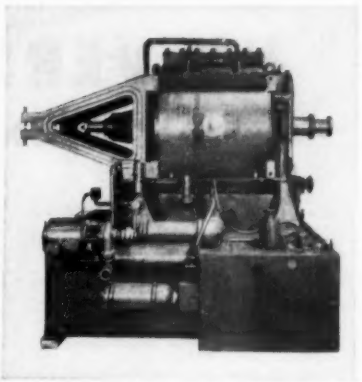


Main power source for huge hydraulic press comes from Greer accumulators. Powerful push required for inserting valves in cylinder block of car engines is stored in accumulators by motor and pump, and then is released by merely operating valve.

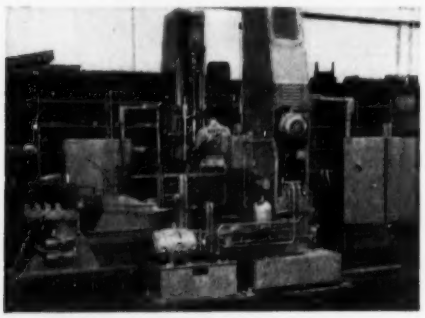
THE GREER HYDRO-PNEUMATIC ACCUMULATOR, with its unmatched ability to store tremendous energy in small space and release it instantly as needed, resulted in better performance, higher efficiency, and greater economy for the machines shown on this page. Read the captions under photos for details.

You're probably planning a new product . . . or how to make a present one better, stronger, at lower cost. Now is the time to call or write Greer hydraulic engineers for recommendations and technical advice without obligation.

GREER
ACCUMULATORS



Fluid dispenser function of the Greer accumulator protects high-speed bearings and shaft of 5000 hp dynamometer used to test turbo-jet engines. Manifolded accumulator, with direct lines to each lubrication point, supplies needed oil under pressure.

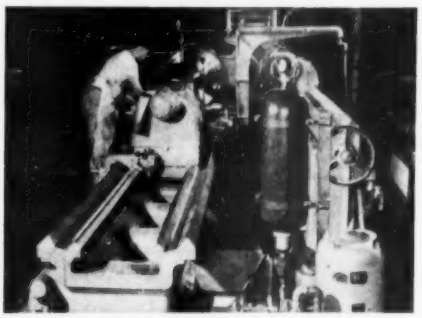


Shock absorber action of Greer accumulator insures smooth operation of honing machine by dampening shocks caused by honing spindles reversing directions. The improved performance means less maintenance and long service life.

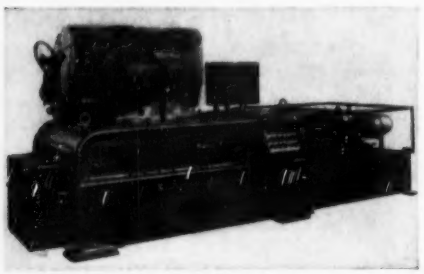
U. S. Patents Under Olaer Licenses

The Greer Accumulator can function as a 1) pressure storage chamber, 2) pressure volume compensator, 3) fluid dispenser, 4) transfer barrier, 5) shock absorber, 6) pump pulsation damper. Available in capacities of 2 cu. ins. to 10 gallons for temperatures from −65° to +180° fahrenheit. Easily installed at low cost.

Write for Brochure 301 for complete data and diagrams.



Auxiliary and emergency power from the Greer accumulator energizes follower on template of hydraulic lathe making jet engine shafts. In case of electric failure, the accumulator stores sufficient power to draw tool away immediately.



Maintaining hydraulic line pressures for giant flash welder is accomplished with Greer accumulators. 190,000 lbs. upset pressure, oil pressure for pilot system, and positive clamp action for welding process comes from only six accumulators.

Smaller motorpump and Greer accumulators give enough power for this trimming and forming machine. Cut cost $600, reduced weight 400 lbs., saved 50% motorpump floor space. Simplified circuit has fewer fittings for less maintenance.

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20" table travel . . . 42" x 12" table . . . full automatic hydraulic table feed.

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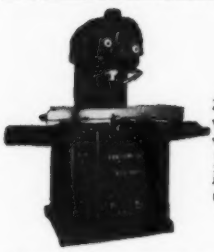
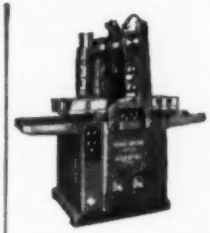


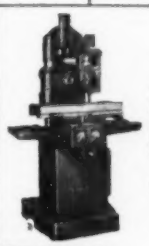
No. 2-20V
20" table travel... vertical spindle with speed range 32 to 1284 R.P.M. . . . 42" x 12" table.



No. 2-20DS
Double Spindle for two milling operations at same time . . . 20" table travel . . . 42" x 12" table.

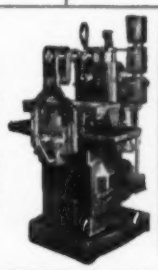
No. 1-14DS
Double Spindle for two milling operations at same time . . . 14" table travel . . . 32" x 9" table.

No. 1-M
Hand feed to table and head . . . 25" x 9" table . . . Adjustable head counter-balance.



No. 1-V
Hydraulic vertical head feed . . . 5½" head travel . . . 25" x 9" table.

No. 1-8
8" table travel . . . 25" x 9" table . . . automatic hydraulic table feed.



No. 1-14
32" x 9" table . . . 14" table travel . . . hydraulic table feed . . . full automatic cycle.

Call on KENT-OWENS for milling machines

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That's why shops like this one make their bolts from Youngstown Cold Heading Quality Bolt Wire or from wire drawn from Youngstown Cold Heading Quality Rods. Youngstown controls each step in steel making from the ore to the finished product. This control gives you top quality steel—free from injurious defects. Payoff comes when thousands of bolts come pouring from your machines—each one perfect and a profit maker! Call or write your nearest Youngstown office for quick service and information.

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Each Achieved With the Right REPUBLIC COLD DRAWN ALLOY STEEL BARS

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The next one wanted an automobile water-pump shaft hard enough to resist thousands of miles of high-speed service without becoming worn and leaky . . .

The third wanted a socket-wrench with a socket that was stronger than the heaviest-handed mechanic . . .

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Each customer is using a different Republic Cold Drawn Alloy Steel Bar grade . . . all three got the high surface quality, the close dimensional tolerance, the high strength, and the UNIFORM MACHINABILITY that helped cut production costs, increase tool life, improve product quality.

Want to try Republic 3-Dimension Metallurgical Service on *your* production problems? A call to your Republic District Sales Office will start action.

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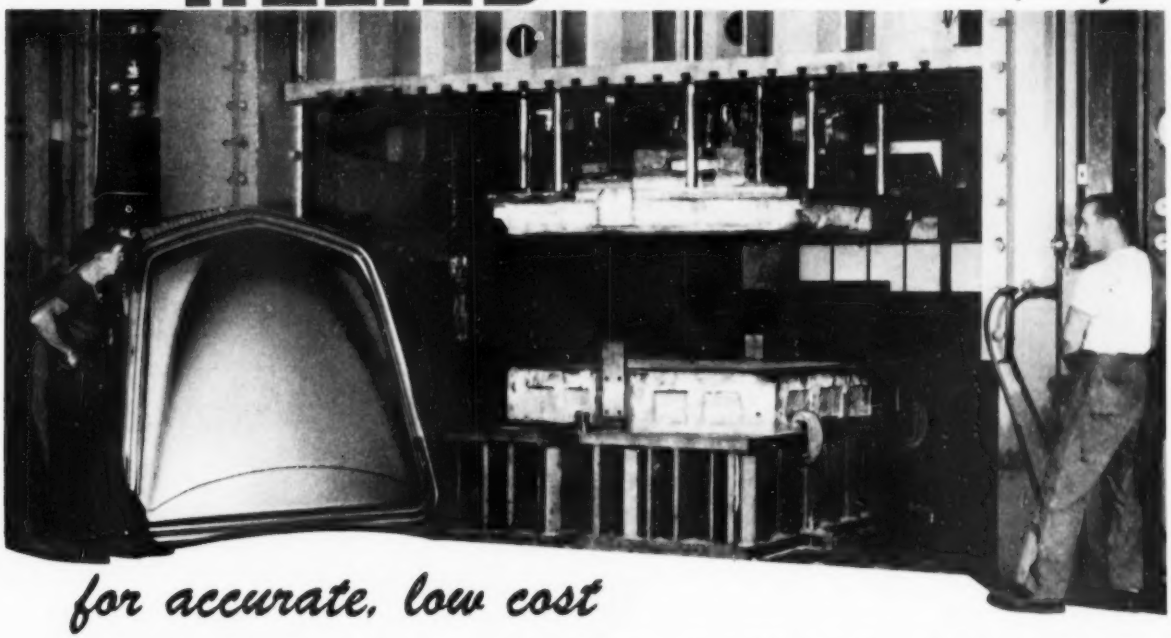
ALLIED *builds the dies... delivers the stampings*



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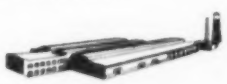
ALLIED PRODUCTS CORPORATION

DEPT. D-15 12605 BURT ROAD DETROIT 23, MICHIGAN

PLANT 1
Detroit, Mich.

PLANT 2
Detroit, Mich.

PLANT 3
Hillsdale, Mich.



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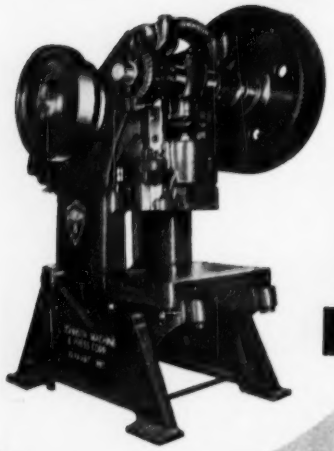
JOHNSON Bonus Built
POWER PRESSES



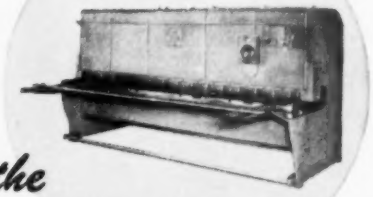
Will give more service for your production dollar because you can handle larger jobs on smaller presses.

RUGGED • DEPENDABLE • TIME-TESTED

Heavier construction, extra safety features, a list of satisfied users are reasons for an ever-increasing demand for Johnson presses. There's a press for your job, too. Write us today.

Johnson MACHINE and PRESS CORP.
620 W. INDIANA AVE. • ELKHART, INDIANA

FAST, ACCURATE AND POWERFUL HYDRAULIC SHEARING IS HERE...
for mild steel up to 10 gauge



the HYDRA-SHEAR

The Hydra Shear surpasses all others in its field for smooth operation . . . no gears or clutch . . . less curl and burring . . . cannot be overloaded. Write for Special Bulletin 53.

CENTER-MIKE AN INSPECTION TOOL THAT . . . COSTS YOU NOTHING!

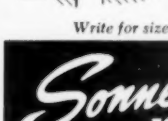
MEASURES HOLE CENTER DISTANCES TO .0005" IN 30 SECONDS!

Center-Mike measures any center to center distance within range—regardless of hole sizes—in thirty seconds without set-up! Yes, this precision center mike COSTS YOU NOTHING! It pays for itself in a few weeks, and then goes on paying you a profit each time it's used! Save time—Save money—Your inspection department is not complete without the CENTER-MIKE.

WRITE FOR FREE BULLETIN 652 NOW!

SORENSEN CENTER-MIKES, INC.
264 KOSSUTH STREET • BRIDGEPORT 8, CONN.

Sonnet's NEW Port Contour Cutter Produces the A.N.D. 10050 hydraulic port contour IN ONE PASS!



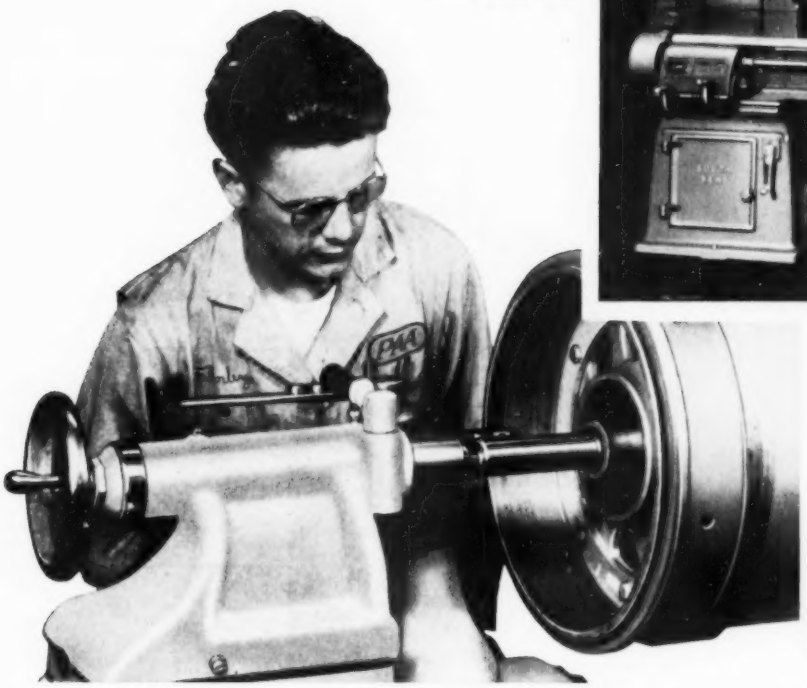
Cuts job time 2/3! This new special-purpose cutter has four flutes, with each flute designed to perform a separate operation. A single pass of the cutter completes the chamfering, counterboring, radiusing, countersinking and spot facing operations necessary to produce the A.N.D. 10050 hydraulic port or connecting hole. As a result, time required to complete the job is cut approximately 2/3!

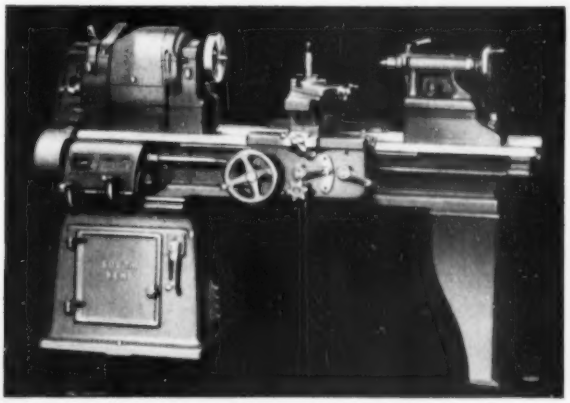
Made from alloy-steel, the new tool is hardened for toughness and carbide tipped for long cutting life and smooth finish. Available with either integral or replaceable pilots.

Write for sizes and prices today

Sonnet TOOL AND MFG. CO.
576 No. Prairie Avenue, Hawthorne, California
Precision cutting tools in high speed steel and carbide

16-24" x 6' Quick Change Gear Lathe





SOUTH BEND 16-24" LATHE

CAPACITY for Big Jobs! ACCURACY for Any Job!

Here's a lathe with a versatility that makes equipment dollars go further. Its 24" swing provides the capacity for handling a variety of large diameter, medium-weight jobs whose size would otherwise require large, heavy lathes. This extra capacity is achieved without any sacrifice of efficiency in the machining of smaller work.

Having an unusually wide range of spindle speeds, all sizes of work can be machined at effective cutting speeds. The improved South Bend two lever gear box permits instantaneous selection of power feeds for any turning, facing, or thread cutting operation. A complete line of chucks, tools and attachments simplifies tooling the lathe.

SPECIFICATIONS: Swing over bed and saddle wings—24⅜". **Collet Capacity**—1". **Spindle Speeds,** sixteen—11 to 710 r.p.m. **Longitudinal Feeds**—48 R.H. or L.H., .0015" to .0841". **Cross Feeds**—48 in or out, .0006" to .0312". **Thread Cutting**—48 Threads R.H. or L.H., 4 to 224 per inch.

Yes—you can get most any South Bend product immediately from our distributor's stocks in principal cities. Items not stocked, shipped promptly from factory.

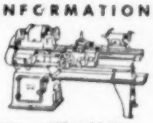
Three ways to order:

1. See or telephone nearest distributor.
2. Order by mail from your distributor.
3. If no distributor is nearby, order direct from factory.

South Bend machine tools with accessories may be purchased on convenient terms up to 12 months.

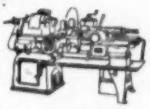
PLEASE SEND INFORMATION CHECKED:

☐ 9" and 10" BENCH LATHES



☐ 10" to 16-24" FLOOR LATHES

☐ DRILL PRESSES



☐ ½" & 1" Collet TURRET LATHES

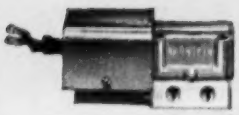
☐ TOOL GRINDERS

☐ 7" BENCH SHAPERS

Name_____ Company _____

Street_____ City & State_____

Building Better Tools Since 1906 • **SOUTH BEND LATHE** • South Bend 22, Indiana



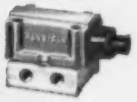
CC1-25, Solenoid-Operated Spring Return

CC6-25, Foot Operated

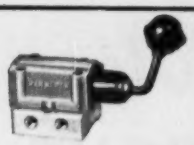
CC11-25, Solenoid-Operated Momentary Contact Type

CC7-25, Foot-Operated Locking

CC2-25, Ball Cam-Operated

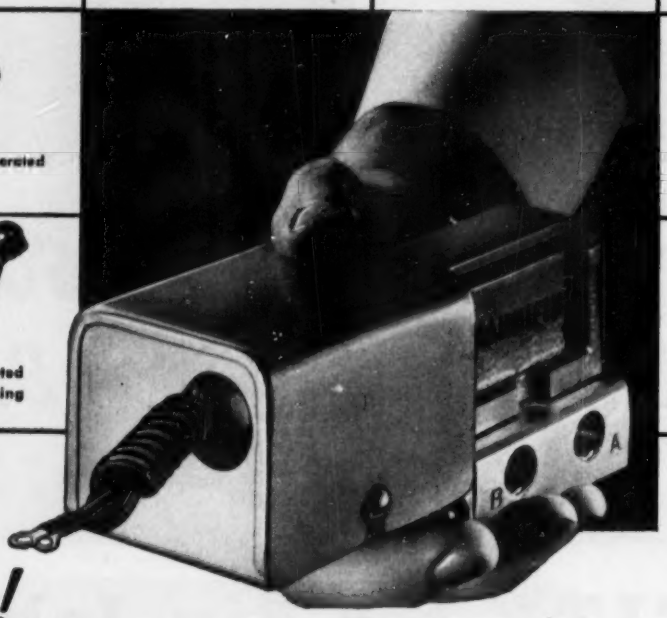


CC10-25, Piston-Operated Spring Return



CC4-25, Hand-Operated
CC5-25, (Same), Locking

CC12-25, Piston-Operated Momentary Contact Type



Now!

¼" P-M 4-Way Valves!

more compact, less expensive than any similar valves

Here's a new series of direct-operated 4-Way Valves for the control of small, double-acting air cylinders. It's the latest addition to Hannifin's revolutionary "P-M" line.

Designed for easier maintenance. The only moving part is the valve stem with its two poppets. The valve body, which contains this stem, is quickly removed from the separate "manifold" to which all pipe connections are made. Thus, the entire valve can be serviced without breaking line connections.

The CC Series. These new "P-M" 4-Way Valves, nominally of ¼" pipe size, flow so much air that they can be used competitively with other ⅜" valves when ordered with ⅜" ports. They are corrosion resistant throughout and meet J.I.C. recommendations.

Compare! You'll find these new Hannifin 4-Way Valves more compact, simpler and easier to use, and *less expensive* than any comparable valves.

GET THE COMPLETE HANNIFIN "P-M" AIR CONTROL VALVE CATALOG

The new Hannifin Controls Catalog contains complete information and specifications on all Hannifin "P-M" Valves, including this new 4-Way direct-operated series. Write for Bulletin 232.

HANNIFIN

Hannifin Corporation, 1117 S. Kilbourn Ave., Chicago 24, Ill.

Air and Hydraulic Cylinders • Hydraulic Power Units • Pneumatic and Hydraulic Presses • Air Control Valves

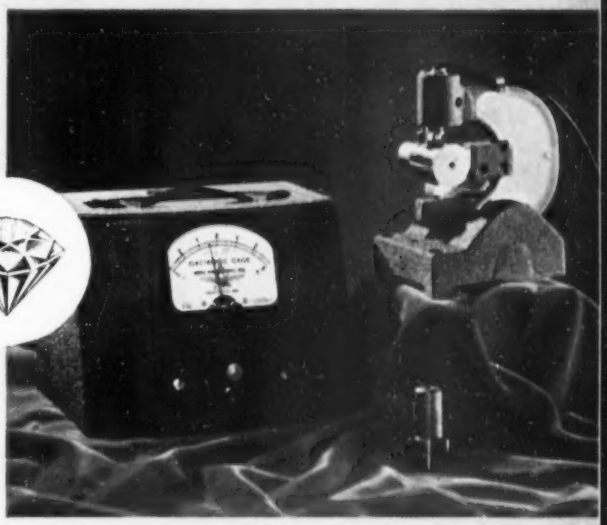
Many months of research and planning have gone into the development of these gages—the newest in precision gaging instruments. Dependable and precise, they are serving ranking industries everywhere.

Model B-10 Electronic Height Gage & Indicator

The gaging hand has a carbide pickup probe which can be easily changed in order to vary the diameter of the ball on the end of the probe from 1/32 to 3/32 of an inch. The arm has a swivel assembly with a screw adjustment for setting the pickup head on the work. The final adjustment is made electronically by a knob on the power unit. The power unit and indicator dial have two ranges which may be changed to suit the requirements of the purchaser.

Model C-10 Snap Gage and Power Unit

An instrument designed to meet the requirements of modern high speed production. This gage may be used to check diameters to tolerances as close as .00001 of an inch without removing the part from the machine. The snap gage is used in conjunction with our standard power unit. The unit is furnished with two optional ranges which can be varied to suit the requirements of the purchaser.



JEWELS OF PRECISION

Model A-10P Electronic Comparator & Indicator

An Electronic Comparator that has proven itself in gage laboratories and on production inspection in plants where precision is the prime requirement. This instrument can be furnished with from one to four increment ranges to suit your requirements. The range classifications are changed simply by dialing a knob on the power unit for the desired range. This instrument can also be furnished with a recording device for use in statistical quality control inspection or as a special gage for inspecting and maintaining records of gage blocks.

Write ***Dept. AM-12*** for booklet and complete information on these gages or any of the Merz wide range of precision instruments. You will find them amazingly superior to all other gages.

MERZ

ENGINEERING INCORPORATED

200 S. HARDING ST. • INDIANAPOLIS 7, IND.

A WEEK'S FINISHING DONE IN A DAY

HAYNES STELLITE alloy milling cutter blades recently solved a tough finishing problem in the production of cast iron mold jackets. Face-milling operations with harder tool materials failed because of chipping and spalling of the cutter blades after finishing only a few castings. Then the foundry tried grinding the jackets. But this was too slow; it took at least 30 minutes to grind each one.

A switch to HAYNES STELLITE Star J-Metal blades cut finishing time to a mere six minutes per casting. An extra saving results from the long life of the HAYNES STELLITE alloy blades. They produce about 350 pieces per grind.

HAYNES STELLITE alloy tools are ideal for cast iron milling jobs because of their high compressive strength at cutting temperatures, good impact strength, and extremely low coefficient of friction. Contact our nearest District Office for on-the-job help with your machining problems, or write for the new manual, "HAYNES STELLITE Metal-Cutting Tools."

This 12-in. diameter cutter, containing 32 HAYNES STELLITE alloy inserted blades, removes 1/16-in. of stock from cast iron mold jackets. A 36-in. casting is milled with this setup in about 1/5 the time required for grinding.

HAYNES TRADE-MARK *alloys*

Haynes Stellite Company
A Division of
Union Carbide and Carbon Corporation
UCC
General Offices and Works, Kokomo, Indiana
Sales Offices
Chicago — Cleveland — Detroit — Houston
Los Angeles — New York — San Francisco — Tulsa

"Haynes" and "Haynes Stellite" are trade-marks of Union Carbide and Carbon Corporation.

5304

FORGET OLD NOTIONS about engine lathes . . .

MEET THE MODERN..

- A LATHE TO SPARK YOUR FANCY
- A LATHE TO WIN YOUR LOYALTY
- A LATHE TO MEET YOUR NEED

BOYE & EMMES LONG LIFE HEAVY DUTY ENGINE LATHE

- **SERIES BB**
- **EIGHTEEN SPEEDS**
- The outstanding value which is built into all Boye & Emmes Long Life, Heavy Duty Engine Lathes is evident in the extra quality features discussed in this folder. Compare Boye & Emmes specifications and features. You will find shorter shafts, more rigidity, greater speed ranges, more compact design throughout. Put one to work in your production and watch it become the "preferred" turning tool among the men who judge by day-in day-out performance.

HEAVY DUTY LATHES SINCE 1895

● *THE STORY* is told in detail in Boye & Emmes Bulletin No. BB531

WRITE FOR IT! . . . no charge . .

BOYE & EMMES
MACHINE TOOL COMPANY
125 CALDWELL DRIVE
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MACHINE TOOL CENTER of the WORLD

YOU WRITE THE SPECIFICATIONS

Our job is to furnish Adams Gears exactly as you want them. Highest quality is assured through close control over every detail of manufacture. The Adams Company, 1942 Cypress Street, Dubuque, Iowa.

the ADAMS line . . .

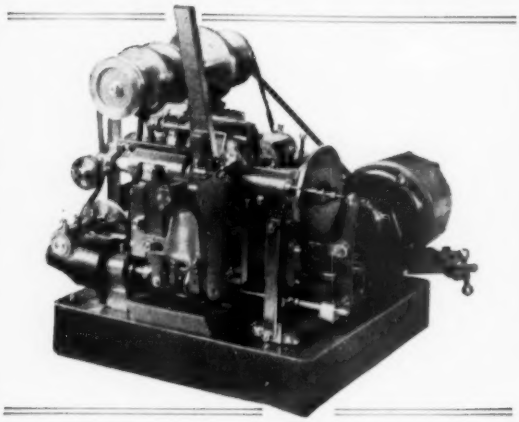
SPUR GEARS	INTERNAL GEARS (Spur and Helical)	SHAVED TOOTH GEARS (Spur and Helical)
BEVEL AND MITER GEARS	RATCHETS	GROUND THREAD WORMS
WORMS AND WORM GEARS	SPLINED SHAFTS	RACKS
SPROCKETS	LEAD AND FEED SCREWS	

The ADAMS Compa
Dubuque, Iowa, U. S. A.
ESTABLISHED 1883

GEARS

FINE GEARS MADE TO YOUR SPECIFICATIONS

WALTHAM
PINION AND GEAR CUTTING MACHINES



Fast, Convenient, Compact, Accurate

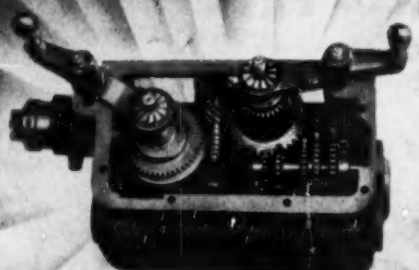
Designed to make high speed production of small gears and pinions available for assembly in watches, instruments, gauges, fuses, etc. Made in Single-Cut, Multiple Cut and Magazine-Feed types. Simple to operate; require no special skill.

Send for detailed information and complete specifications.

WALTHAM MACHINE WORKS
High Street, Waltham, Mass.

ACME QUALITY GEARS

For twenty-five years Acme Gears have been giving unsurpassed service in industrial, automotive, marine and aircraft equipment.



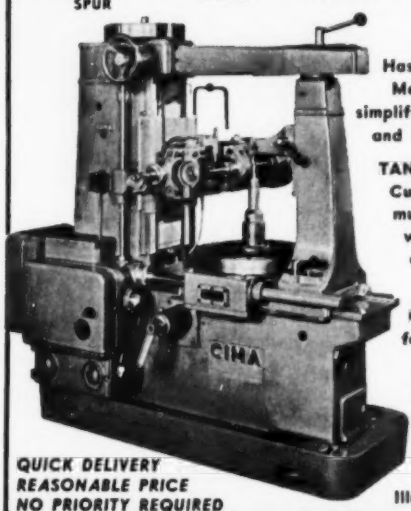
Acme facilities include over one hundred major machine tools for gear cutting to your exact needs.

Territories Available for Sales Representatives

ACME GEAR CO.

CIMA UNIVERSAL GEAR HOBBING MACHINE

CAPACITY 20" DIA. 5 D. P.



Has DIFFERENTIAL Mechanism to simplify cutting spiral and helical gears.

TANGENTIAL Feed Cutter Head for multiple-thread worm gears and worms.

Employs CLIMB CUTTING for better finish.

Power Feed and Rapid Return in all directions - Quick set-up.

QUICK DELIVERY
REASONABLE PRICE
NO PRIORITY REQUIRED

Write for Illustrated Folder

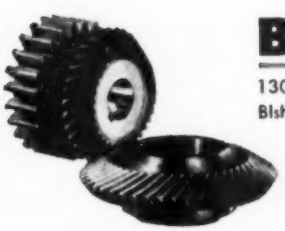
GEORGE SCHERR CO., Inc.
COMPLETE LINE OF PRECISION INSTRUMENTS
200 AM LAFAYETTE ST. • N.Y. 12, N.Y.

above • Looking down inside you see gears ready for shot-peening and spiral conveyor which returns used shot

right • Front view with lid raised showing other gears to be shot-peened

Shot-Peening is a method of toughening gears to make them wear longer. BRAD FOOTE'S shot-peening machine, one of the largest ever made, bombards the gear with shot under pressure. As each shot strikes it compacts the metal and hardens a minute area of the gear's surface.

• Shot-peening is another service which BRAD FOOTE has available for improving the quality of gears you buy for use in your own shop... or on the equipment you make for others. It is another step in our complete gear manufacturing process which means that "*no one shares our responsibility.*"



BRAD FOOTE GEAR WORKS, INC.

1309 South Cicero Avenue • Cicero 50, Illinois
Bishop 2-1070 • OLympic 2-7700

subsidiaries

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Lemont, Illinois

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Pittsburgh 22, Pennsylvania

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LO-JET ACRO

The revolutionary new cooling system that*

KEEPS CUTTING TOOLS AND WORK AT ROOM TEMPERATURES!

*Proven results at leading automotive manufacturers.***

eight outlets

SPEEDS PRODUCTION

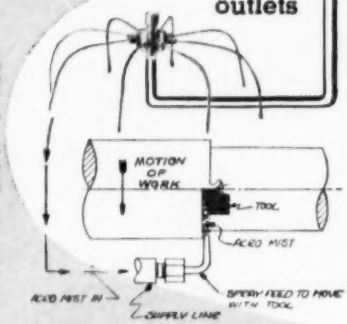
CUTS COSTS

USED FOR ALL MACHINING OPERATIONS

PROLONGS TOOL LIFE

CUTS TOOL BREAKAGE LOSS

IT'S CLEAN, TOO!



One unit can service up to 8 operations

*Controlled compressed air operation for all types of metal cutting with special ACRO-COOLANT soluble solution.

**Names on request.

Our engineering staff will cooperate FREE of charge. Send blue-prints for estimate.

Write now for more information with no obligation to you!

AIR CONVERSION RESEARCH *corporation*

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gentlemen: Please send me FREE literature and details of the new acro low jet.

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company_____

address_____

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HEAVY DUTY GEARS *for Tough Jobs*

Ready for shipment, the H-arm spur gears shown above will see grueling service in mine hoists. Superbly constructed by Stahl craftsmen using the finest in precision equipment, as are all Stahl products, they will prove more than equal to the demands of the job. If it's gears you need, it will pay you to get Stahl's estimate first.

SPURS TO 72" PD, 1 DP

BEVELS TO 54" PD, 1 DP

SPIRAL, HELICAL and WORM GEARS TO 48" PD, 2 DP

CONTINUOUS-TOOTH HERRINGBONE TO 60" PD, 2 DP

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HEAT-TREATED, CASE OR FLAME HARDENED GEARS – OF CARBON OR ALLOY STEEL

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GEAR & MACHINE COMPANY

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Buy safe "SHUR-GRIP" drop forged HANDLES

Designed to hold 3 to 6 lb. lead hammer heads more firmly — will not slip — keeps hammer head in shape longer — makes remolding easier, quicker, surer, less expensive.

Write for circular and prices

LAWRENCE H. COOK, INC.

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- SPUR — SPIRAL — WORM
- BEVEL GEARS GENERATED WITH PRECISION ON MODERN EQUIPMENT.
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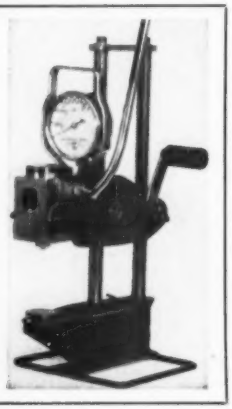
KING PORTABLE BRINELL HARDNESS TESTERS FOR ALL BRINELL TESTING

Puts an actual load of 3000kg on a 10mm ball.
Throat, 4" deep.
Gap, 10" high.
Weight, 27 lbs.
Test head removable for testing large parts—castings, forgings, etc.
Equally accurate as portable or stationary equipment.
Can be used in any position—even upside down.



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Box 606 J Ardmore, Pa.

The Forger
ARTICLE 8
MULTIPLE OPERATION FORGINGS HAVING DEEP HOLES THAT DO NOT EXTEND THROUGH THE ENTIRE FORGING
MULTIPLE OPERATION SOCKET WRENCH DIES
SKETCH "A"
MULTIPLE OPERATION FOR DEEP PIERCED FORGING
PROGRESSIVE PIERCING METHOD
SKETCH "B"

aids TO MODERN FORGING PRACTICE

YOU ARE INVITED to have your name placed on our mailing list to receive this valuable series of articles on up-to-date forging methods. We will be glad to send a complete set of all eleven issues of "The Forger" in addition to placing your name on our mailing list to receive future issues as they are prepared. There is absolutely no charge for this service. We are glad to make this gesture towards the advancement of modern forging practice as executed on ACME XN Forging Machines.

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ACME MACHINERY DIVISION • **1207 W. 65th St., Cleveland 2, Ohio**
ESTABLISHED 1882

"ACME" FORGING • THREADING • TAPPING MACHINES • ALSO MANUFACTURERS OF "HILL" GRINDING AND POLISHING MACHINES
HYDRAULIC SURFACE GRINDERS • "CANTON" ALLIGATOR SHEARS • PORTABLE FLOOR CRANES • "CLEVELAND" KNIVES • SHEAR BLADES

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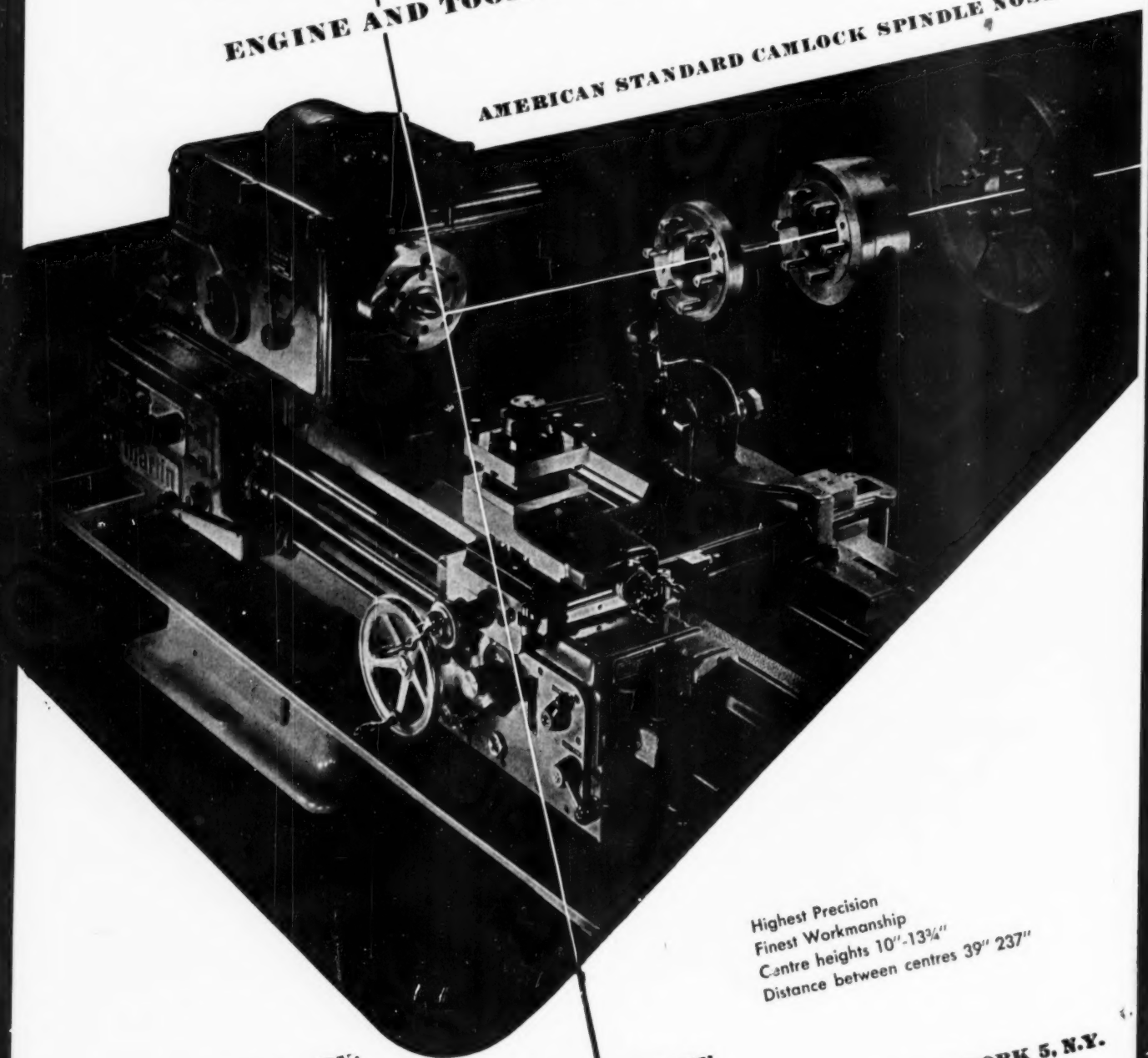
ENGINE AND TOOLMAKERS LATHES TYPE DL 500

AMERICAN STANDARD CAMLOCK SPINDLE NOSE



Highest Precision
Finest Workmanship
Centre heights 10"-13¾"
Distance between centres 39" 237"

MANUFACTURED BY:

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MACHINE-TOOL-WORKS OFFENBURG WEST-GERMANY

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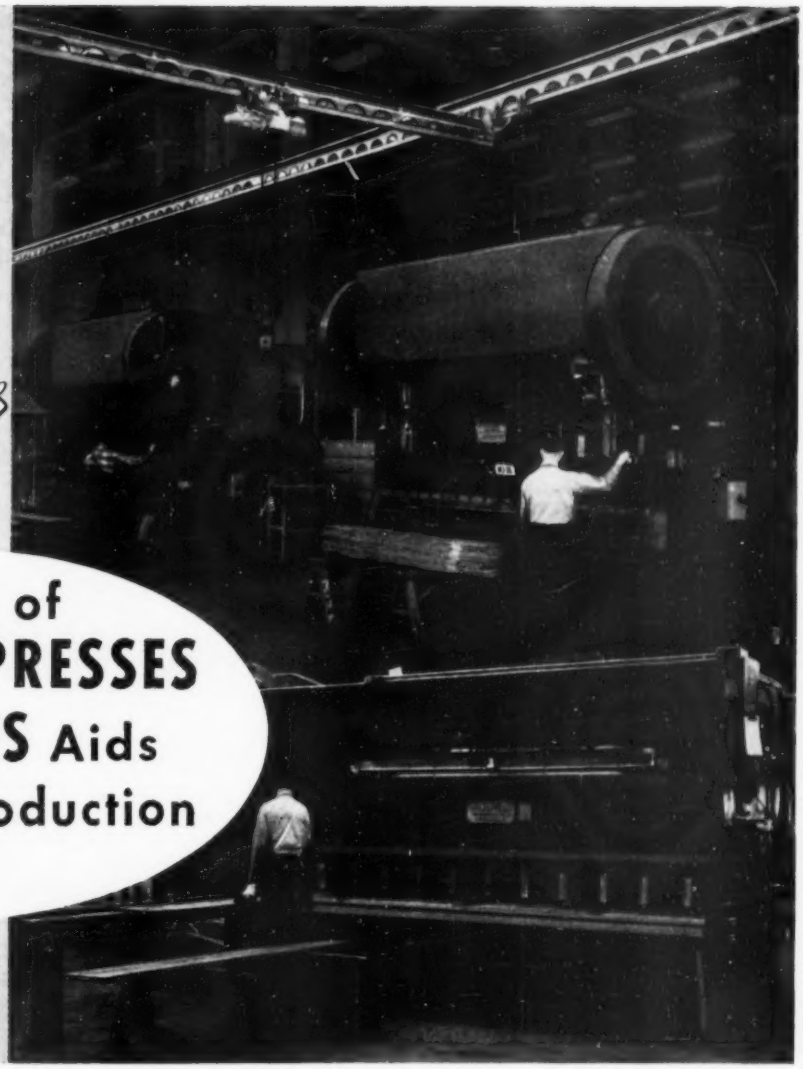
Early Deliveries

Two of the Steelweld Presses in action. These are Model K5-10 machines rated for 12'-0" x ⅜" steel plate. Note how Cleveland Tramrail cranes serve these presses.



Battery of STEELWELD PRESSES and SHEARS Aids Caterpillar Production

Shearing long ½-inch thick strips into small rectangles on a Series 8D-10 Steelweld. The long extension squaring arm at front facilitates this work.

THOUSANDS of tons of steel of different thicknesses are sheared and formed on Steelweld Shears and Presses into various shapes required for the large volume of tractor equipment produced at the new Joliet, Illinois, plant of Caterpillar Tractor Co. These items include scrapers, rippers, bulldozer blades and wagons.

The heavy construction of Steelweld machines and many high quality features with which they are provided make possible continuous trouble-free performance. Their design includes a number of innovations which ease operation, speed production and enable accuracy to close tolerances.

The fact that Caterpillar has bought Steelweld Shears and Presses repeatedly and now has a large battery of them is mute testimony to the satisfaction they are giving.

GET THESE BOOKS!

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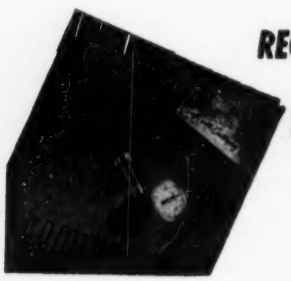

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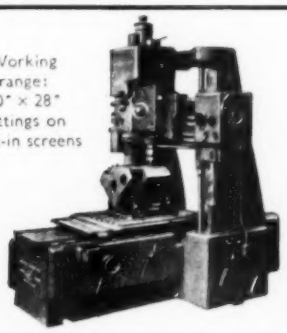

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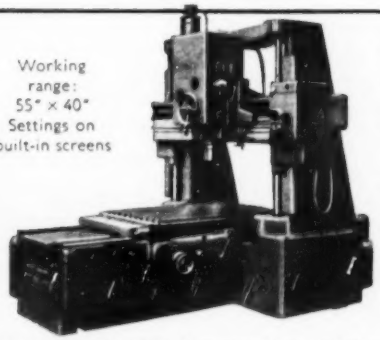

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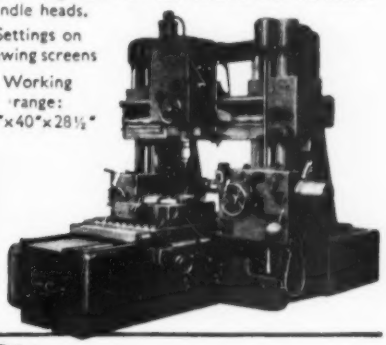

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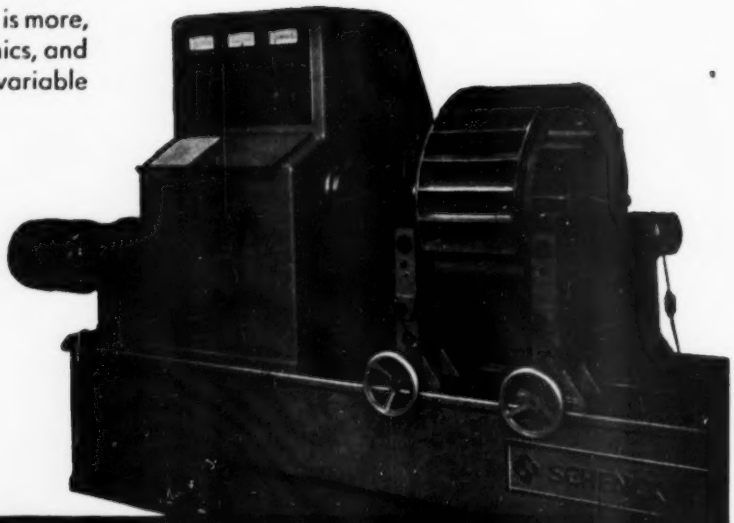

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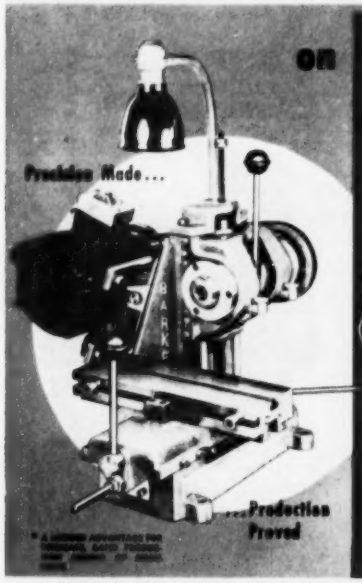

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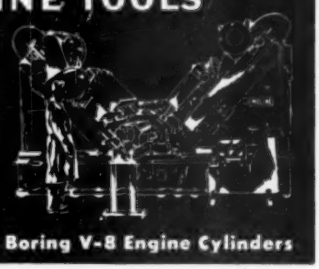

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Penn Electric Switch Co. saves $7,345 per year on scrap loss alone with one 4-ton

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Cuts scrap loss $7345.00 per year.

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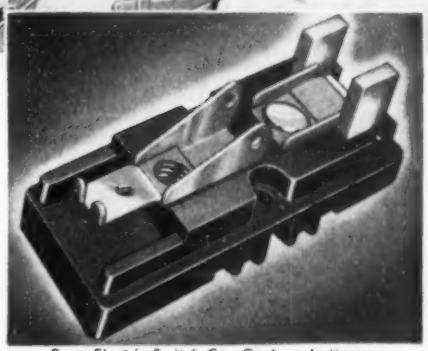

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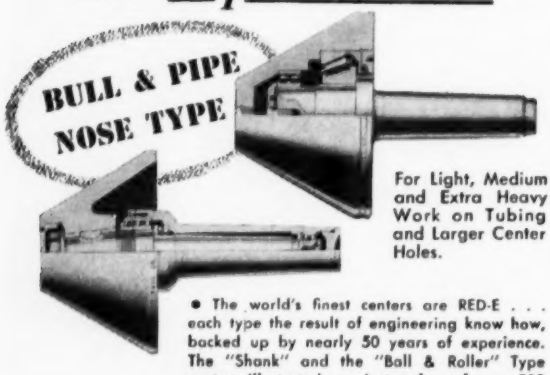

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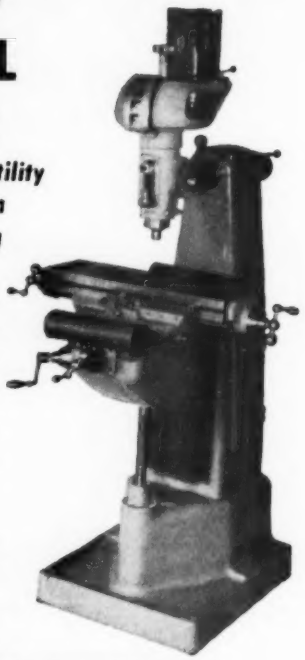

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Table size	8" x 24"
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Maximum Distance Spindle to table	15"
Quill Travel	3"
Collet Capacity	½"
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Motor	¾ H.P.
Weight of Milling Machine approx.	1200 lbs.

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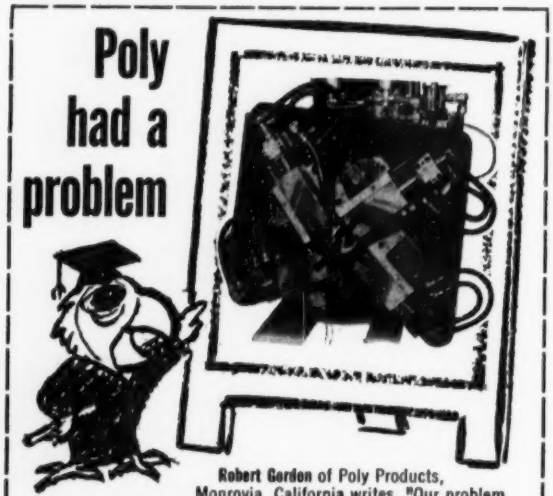

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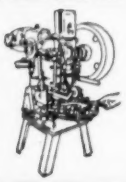

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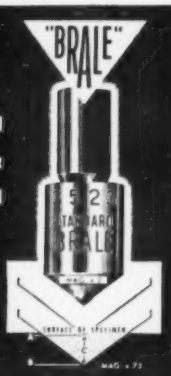

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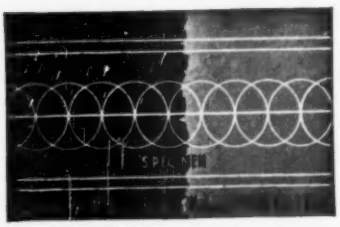
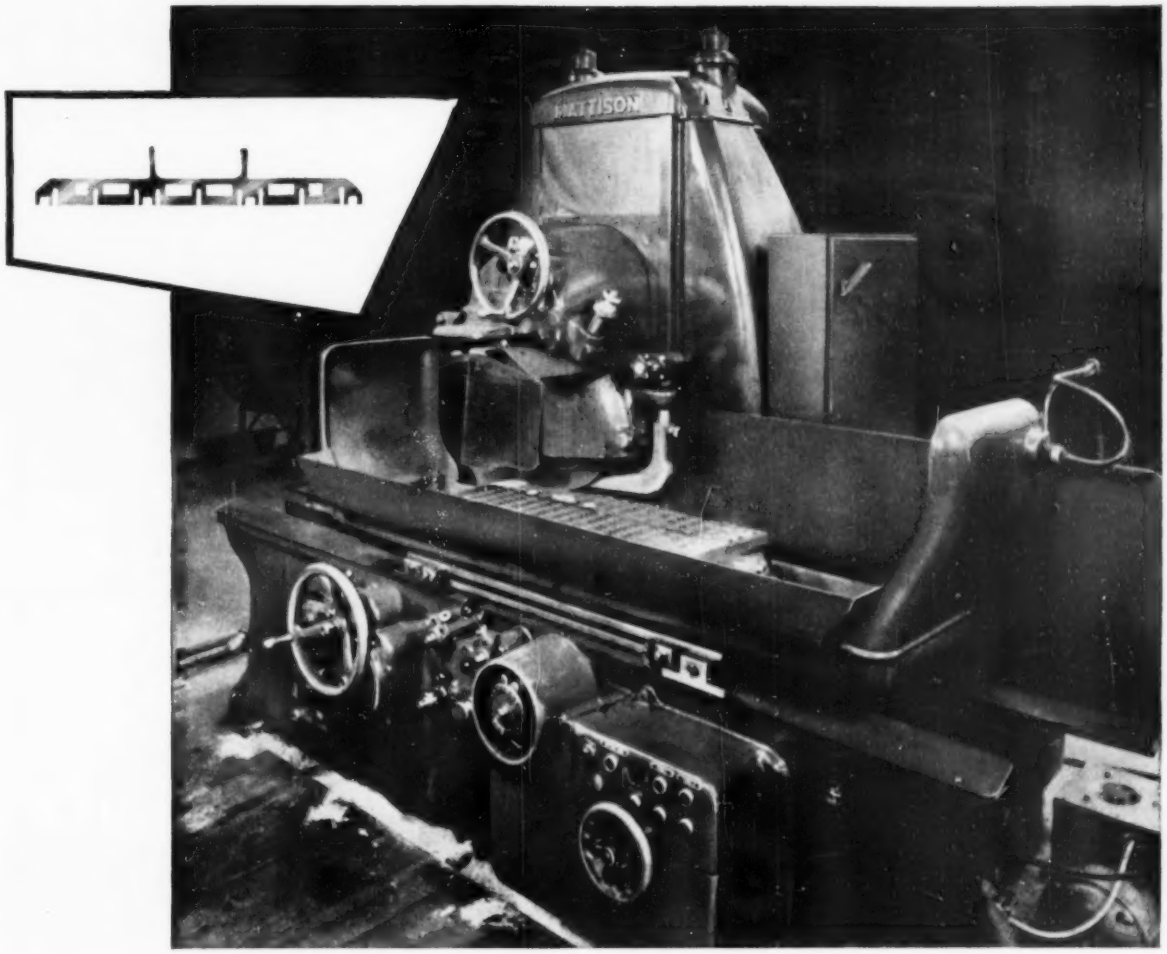


Simply brush on right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

Write for full information

THE DYKEM COMPANY, 2301B North 11th St., St. Louis 6, Mo.



.020 THICK BLADES GROUND 440 AT A TIME ON MATTISON GRINDER FOR SUNBEAM CORPORATION

Here is an unusual grinding job at the Sunbeam Corporation Plant being performed rapidly and accurately with the Mattison Grinder shown above. 440 Shavemaster blades only .020″ thick are ground at one time at a considerable saving in time over previous method.

With the Mattison High-Powered Precision Surface Grinder you have the high power and rugged, double-column construction for rapid stock removal; large capacity which means more pieces of work per load; and the precision and sensitivity necessary for fine, high-quality finish and accuracy to close limits.

This combination not only enables you to step up production on small parts but permits grinding large work which previously could not be handled. Send for free circular containing complete information as well as numerous other examples of work ground on the Mattison Grinder.

MATTISON MACHINE WORKS

ROCKFORD · ILLINOIS

Doubly Guaranteed

BRYANT (ROCK OF AGES) GRANITE SURFACE PLATES

NOW, users of granite surface plates can get surface plates that are guaranteed both as to highest quality of stone and utmost precision of surface.

Bryant, maker of precision machine tools and gaging equipment, joins with the world-famous Rock of Ages quarry in producing these new granite surface plates which offer unsurpassed advantages in layout, inspection and assembly work.

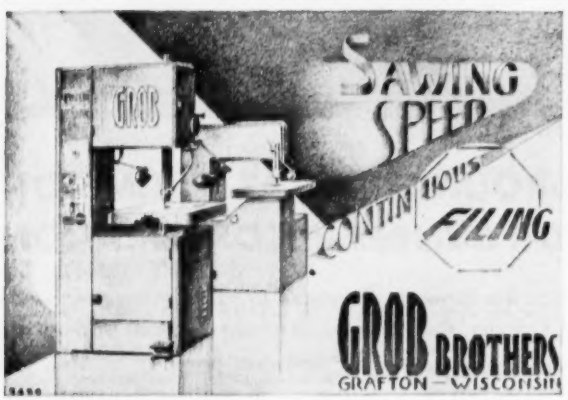
Rock of Ages granite is unique in its exceptionally close-knit composition and flawless texture. The stone is finished on the head of the grain, a patented process.

Bryant Granite Surface Plates are economical because of their low initial cost . . . maintenance-free qualities . . . long-lasting accuracy.

Bryant *unconditionally guarantees* the flatness and accuracy of all Bryant Granite Surface Plates.

Write today for free specification folder

BRYANT CHUCKING GRINDER CO., Springfield, Vermont, U. S. A.



SCHAUER SPEED LATHES

These versatile machines handle an almost *unlimited* variety of work —deburring, filing, lapping, polishing, etc.—on metal and plastic parts. Thousands in use. Production increases up to 158% reported! Many sizes and models. Holding devices to suit the job. *Speed your production with Schauer Speed Lathes.*

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B & RB PRECISION BEARINGS

Are selected for dependability, longer life and greater capacity. Standard sizes are carried in stock. *Write for our general catalog No. 19.*

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DANBURY, CONNECTICUT

The Chairman of the Federal Reserve System Subcommittee on Collections tells . . .

How to collect $2,000,000 a minute!

"90% of the nation's business is transacted by check!" says Mr. Valentine Willis, Vice-President of the Federal Reserve Bank of New York. "But it wouldn't be possible without an efficient system of transporting and handling this enormous volume of 'cash letters.'

"Every day, the Federal Reserve System collects checks worth billions of dollars from all parts of the country. The sooner we can return checks to their 'home' banks and give depositors their money, the better for business.

"In the past ten years, the *maximum* time for sending checks 'home' has been cut from seven to two days. For this amazing record, we give a lot of 'credit' to Air Express!

"We ship more than 8,400 pounds of checks in an average day via Air Express, between the 12 Federal Reserve Banks and their branches. These packages weigh from two pounds to 450 pounds. One busy day, one Federal Reserve Bank shipped almost three *tons* of checks via Air Express!

"Checks are the lifeblood of our economic system. Air Express has become a vital artery in this important work.

"Understanding economy is part of our job. We've found that we can buy Air Express speed, in most weights and distances, at lower cost than any other air service."

It pays to express yourself clearly. Say Air Express! Division of Railway Express Agency.

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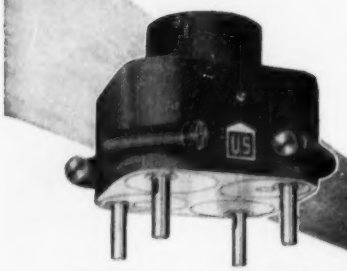
GETS THERE FIRST via U.S. Scheduled Airlines

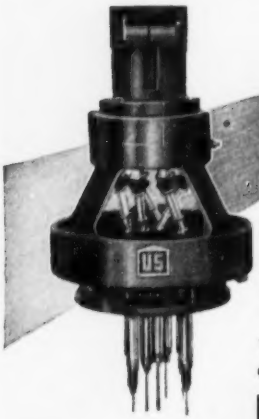
...to protect your investment... save time, money and labor!



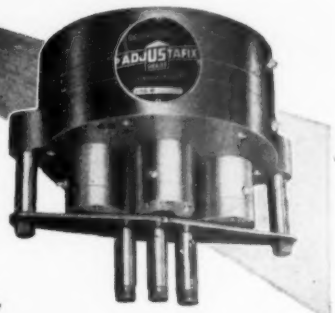
Single eccentric type for equally spaced holes on bolt circles.

US HEADS
SINCE 1915

U. S. drill heads are built for continuous use, with full anti-friction bearing construction, for high capacity thrust leads . . . precision-bored, outboard spindle support plate.



The universal joint adjustable multiple spindle type, an adaptation of a universal joint adjustable spindle, is suitable for any sensitive drilling machine. Joints self-lubricating. Designed for quick change.



New double eccentric AdjUStafix, two to eight spindles, for any adjustment. Eliminates the expensive change in set-up from job to job by simply changing the drill pattern plate and relocating spindles. Fully automatic lubrication for either horizontal or vertical operation.

We manufacture all types of multiple spindle, fixed center, adjustable and lead screw tapping heads.

UNITED STATES DRILL HEAD CO., 616-618 Burns St., Cincinnati 4, Ohio

Carbide Tipped Tools *Work Better* in a Clark ADJUSTABLE TOOL HOLDER

Exclusive vise grip jaw runs full length of cutter channel . . . hugs bit so it can't rock, chatter, slip, sag or break . . . *permits faster feed, deeper cuts!* Holds all sizes—square, round, undersize or narrow bits for cutting off or special forming operations. Also available with 15° cutter channel for H.S.S. tool bits.

SPECIFICATIONS

Model	Size	Tool Capacity
P-60	0	1/8 to 3/16
P-61	1	3/16 to 3/8
P-62	2	1/4 to 1/2
P-64	4	3/16 to 5/8

Specify left or right hand offset

For complete information call your Clark Cutter Jobber now or write Factory A

ROBERT H. CLARK COMPANY
9330 Santa Monica Blvd. • Beverly Hills, Calif.
Manufacturers of Precision Cutting Tools

PRECISION PRODUCTION at GRAFLEX

At Graflex, Inc., in Rochester, N.Y., operators inspect their own work and get paid for it, and foremen have full freedom of action. These are just two important characteristics of the organization of the camera and precision-equipment manufacturer bearing this familiar name.

This *American Machinist* Special Report by Executive Editor E. J. Tangerman describes production methods at Graflex in detail. Over fifty photographs and other illustrations add to the value of the twenty-page report.

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Scott wipers are the result of years of testing and research. They're designed to meet your general industrial wiping needs—big or small.

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A trial installation supervised by one of our technicians working with your people has developed to be the most accurate way to prove this product. If you would like information on such a trial period—and the full story on Scott Wipers—mail coupon below.

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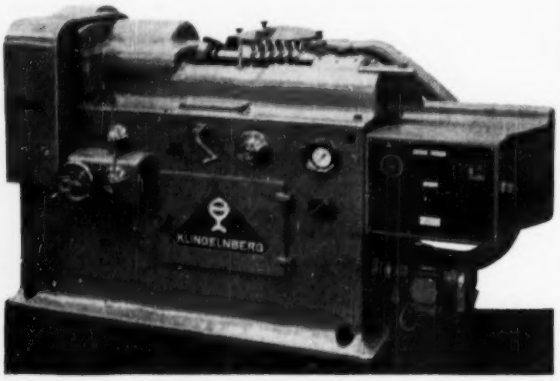
One way to eliminate operator errors in hob sharpening . . .

KLINGELNBERG Model GW 30 automatic hydraulic HOB SHARPENER



Grinding a precise front rake and uniform indexing from flute to flute is an automatic certainty when you sharpen your gear hobs on the Klingelnberg GW 30.

The skill is built into the machine–the operator guesswork taken out. And its consistent accuracy and economical performance is proving out in many leading plants–De Laval, Milwaukee Gear, Chicago Gear. Philadelphia Gear and Hyster Co., for example.

Here's why:

UNIFORM SHARPENING of every hob to the same spiral lead–through use of change gears instead of sine bars. For any lead angle setting, generating line of grinding wheels passes through hob axis without special dressing devices–prevents excessive grinding.

GREATER ACCESSIBILITY when changing hobs–because grinding head operates sideways from rear of machine–*not* above workpiece.

Indexing accuracy of .0001" assured by hardened indexing plates with ground flanks. Indexing from flute to flute by hydraulic pressure without back-lash.

RIGID MOUNTING of hob and index plate on same spindle. No moving parts between.

Write for descriptive catalog. If you are in the vicinity of Newark, N. J. or Los Angeles, we'll arrange a demonstration at our Service Centers in these cities.

Specifications:	
Maximum stroke of wheel slide	20"
Maximum grinding length	16" and 20"
Maximum diameter of hob	12"
Grinding spindle speed	Approx. 1500 r.p.m.

KURT ORBAN COMPANY, INC.
205 E. 42nd St., New York 17 • 1256 E. 12th St., Cleveland 14
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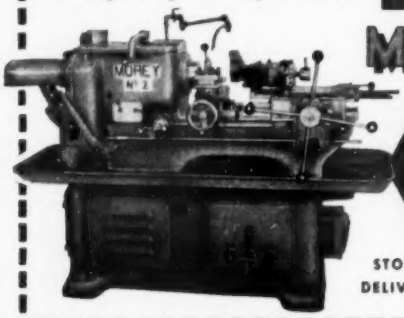
For Ease, Economy and Simplicity of Operation

DEPEND ON THE **MOREY**



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Sales territories open

PARTIAL LISTING OF SPECIFICATIONS:

Bar work capacity	1" dia. x 6"
Chucking capacity	8" dia.
Swing over bed	14"
Hole through spindle	1-9/32"
Spindle speeds (Back gear ratio): 60-2000 RPM Inf. variations with constant speed, AC 1800 RPM motor 1:5.8	
Motor	3 HP

Write us today for complete details!

MOREY *for machine tools!*
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Special Machinery

HEBERT Equipment Co. • Romeo, Mich.

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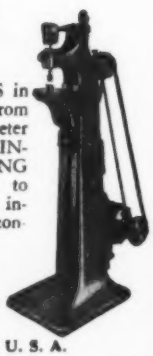

RIVETERS — PIONEERS in their line—head rivets from smallest to ¾" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.

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Bending Heavy Beams is light work for a WILLIAMS-WHITE HYDRAULIC BULLDOZER

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ESTABLISHED IN 1854

MAKERS OF QUALITY PRODUCTION MACHINERY FOR NEARLY 100 YEARS

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Communist machine-gun fire dropped him in combat. But whole blood kept him alive, saw him through the hospital. He thanks you for his life.

She'd been exposed to polio. A new serum, *Gamma Globulin*, made from blood, helped ward off the dread disease. She thanks you for her life.

A tornado whipped suddenly across her home town. She was badly injured by falling debris. But a quick operation, several transfusions pulled her through. She thanks you for her life.

Three grateful people say: "We're HERE... because you were THERE!"

Each one of these people is alive today because someone gave blood.

If you've given blood before, you know how easy it is—how quick and painless. And you know what a wonderful feeling it is when you realize that what you've done may give another person his life.

Now you are asked to give blood . . . again and again. And you can do it safely every 3 months.

Because America's need for blood has increased enormously—for our armed forces, for accident and disaster victims at home, for new disease-fighting serums.

Many a life hangs in the balance! Will you help? Call your Red Cross, Armed Forces or Community Blood Donor Center today!

BUSINESS EXECUTIVES CHECK THESE QUESTIONS

If you can answer "yes" to most of them, you—and your company—are doing a needed job for the National Blood Program.

- ◯ HAVE YOU GIVEN YOUR EMPLOYEES TIME OFF TO MAKE BLOOD DONATIONS?
- ◯ HAS YOUR MANAGEMENT ENDORSED THE LOCAL BLOOD DONOR PROGRAM?
- ◯ HAS YOUR COMPANY GIVEN ANY RECOGNITION TO DONORS?
- ◯ HAVE YOU INFORMED EMPLOYEES OF YOUR COMPANY'S PLAN OF CO-OPERATION?
- ◯ DO YOU HAVE A BLOOD DONOR HONOR ROLL IN YOUR COMPANY?
- ◯ WAS THIS INFORMATION GIVEN THROUGH PLANT BULLETIN OR HOUSE MAGAZINE?
- ◯ HAVE YOU ARRANGED TO HAVE A BLOODMOBILE MAKE REGULAR VISITS?
- ◯ HAVE YOU CONDUCTED A DONOR PLEDGE CAMPAIGN IN YOUR COMPANY?
- ◯ HAVE YOU SET UP A LIST OF VOLUNTEERS SO THAT EFFICIENT PLANS CAN BE MADE FOR SCHEDULING DONORS?

Remember, as long as a **single** pint of blood may mean the difference between life and death for **any** American . . the need for blood is **urgent!**

NATIONAL BLOOD PROGRAM

GIVE BLOOD

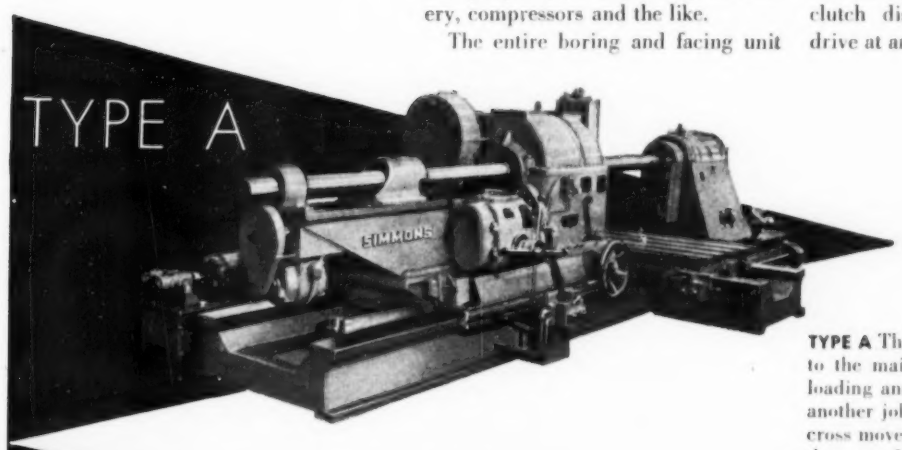
...give it again and again

EXTREME ACCURACY...HIGHER CUTTING SPEEDS...FASTER STOCK REMOVAL...

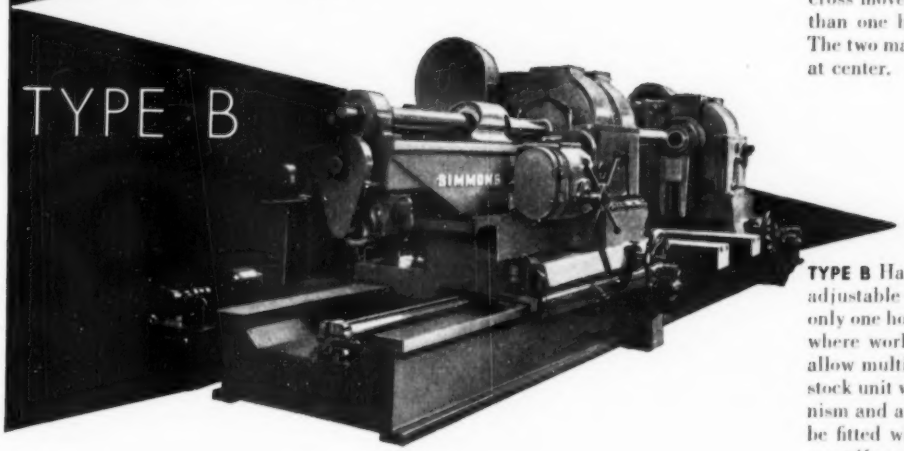
WITH SIMMONS 6" AND 8" BAR HORIZONTAL CYLINDER BORING AND FACING MACHINES

Power and rigidity...these Simmons machines have all you need to push carbide tooling through a full range of speeds and feeds. They're the production engineer's answer for large diameter cylindrical boring and facing jobs for steam turbines, diesel engines, centrifugal pumps, refrigerating machinery, compressors and the like.

The entire boring and facing unit on these Simmons machines is moved hydraulically along the bed; the boring bar has a mechanical screw feed; a power take-off for the feed gearing on the continuous feed facing head eliminates the usual star feed device and permits use of high-speed cutters for facing; an electrically-operated clutch disengages or reverses feed drive at any point.



TYPE A The traverse bed at right angles to the main bed allows 1) setting up, loading and unloading of one job while another job is being bored or faced; 2) cross movement of work on which more than one hole is to be bored or faced. The two main beds join this traverse bed at center.



TYPE B Has single in-line bed with two adjustable tables. Recommended where only one hole is to be bored and faced, or where work is too large or unwieldy to allow multiple mounting. Has one headstock unit with boring and facing mechanism and auxiliary headstock which can be fitted with boring and facing equipment if required.

BOTH TYPES are of "unit-type" construction and, to meet your particular production requirements, modifications can be made in specification of swing, bar diameter, bar length, bed length, table area and travel or spindle speeds.

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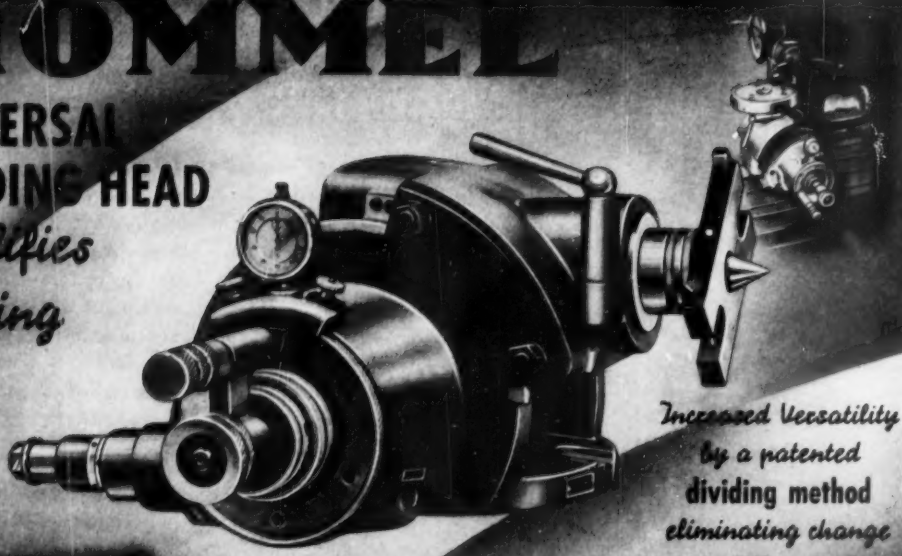

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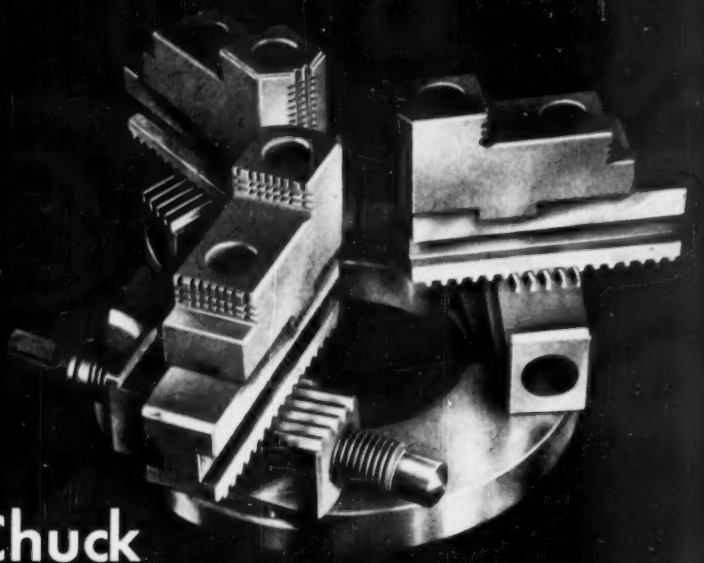

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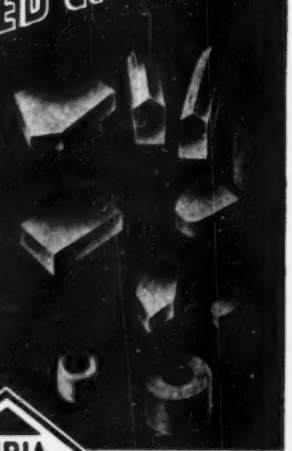

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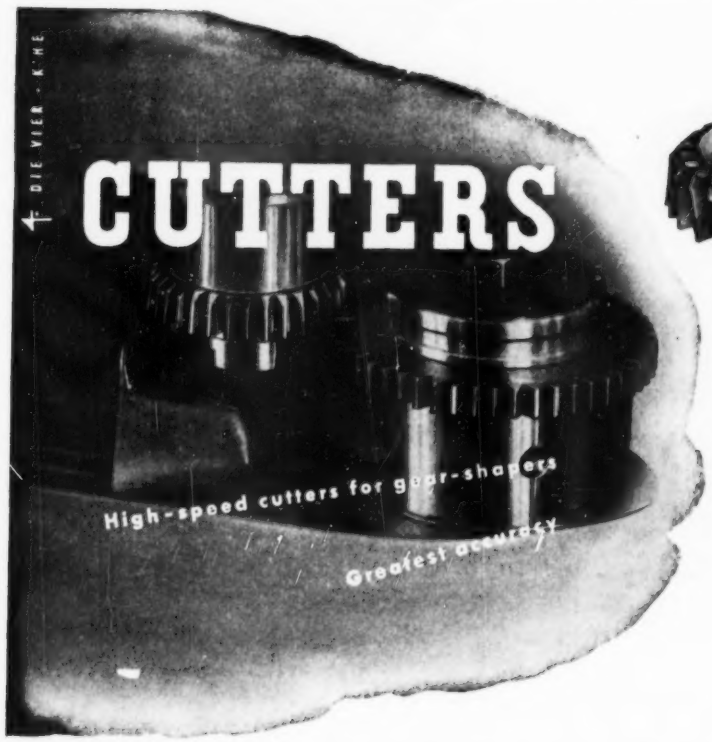

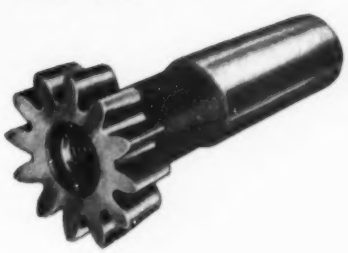

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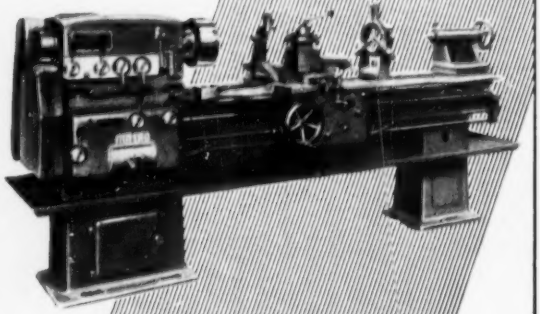
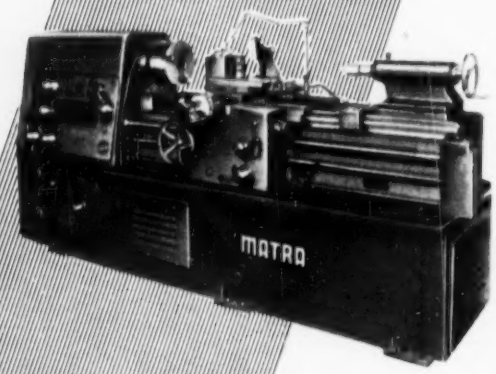
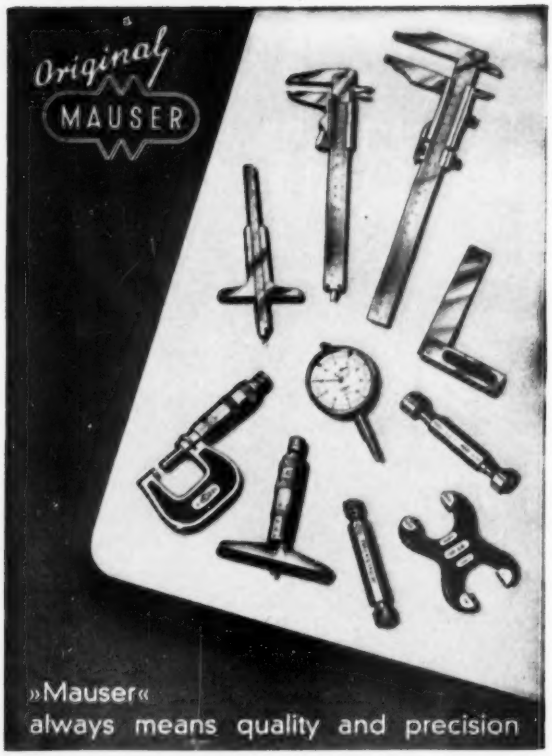
High Speed Precision Lathe Model MDR 22/25 height of centres 220 or 250 mm distance between centres 1000 to 4000 mm





High Speed Production Lathe Model MDR 20 height of centres 200 mm distance between centres 1150 mm

MATRA-WERKE G.M.B.H.
FRANKFURT A. MAIN 301



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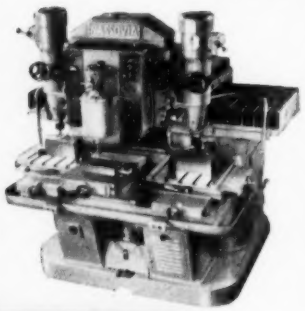

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with **2 milling spindles** and **1 tracer head**
Electro-hydraulic universal machine for **die-sinking** and **contour milling**
Workpiece: ± 0,0004" – 0,0012"
Surface finish: 0,00004" – 0,0002"

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Here are economical, sales-building methods that produce more attractive products

SUPPLIES UP - TO - DATE INFORMATION ON:

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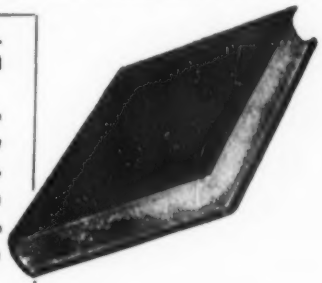
—the commercial aspects of metal finishing
—the sales value of attractive finishes
—the economics of metal finishing
—the design of parts which require finishing
—new finishing equipment and processes
—metal finishing costs



HERE'S a manual which demonstrates the vital importance of the finishing process in the final appearance and sales appeal of a product and describes each of these processes in careful detail so that you may achieve an attractive finish as efficiently and economically as modern methods will allow. With special attention to improving results and reducing costs, the book covers all types of finish, such as galvanizing, polishing, plating, lacquering, enameling and painting—wood grain reproduction, chromium plating, and synthetic enamels, and many new finishes of a specialized nature.

FINISHING METAL PRODUCTS

By HERBERT R. SIMONDS
Consulting Engineer

and ADOLPH BREGMAN
Consulting Engineer, Executive Secretary, Masters Electric Plating Association

Second Edition

352 pages, 5¼ x 8¼, 147 figures, $6.00

The revised edition of this highly useful manual describes many new developments, and incorporates the rapid progress in plastics and synthetic resins. Chapters on coloring metal, on costs and estimates and on organic coatings have been added. Answers to every kind of question which arises in connection with the finishing processes are supplied in careful detail, aiming at the most efficient and economical means of achieving a highly attractive finished product with a maximum of selling appeal.

Read this partial list of chapter headings for a few of the important processes and topics described:

- Sales Value of Attractive Finish
- Importance of color
- How to Minimize Cleaning Expense
- Pickling for a Better Finish
- Polishing in Industry
- Designing Products to Reduce Polishing Expense
- Recent Developments in Plating
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- Spray Coating
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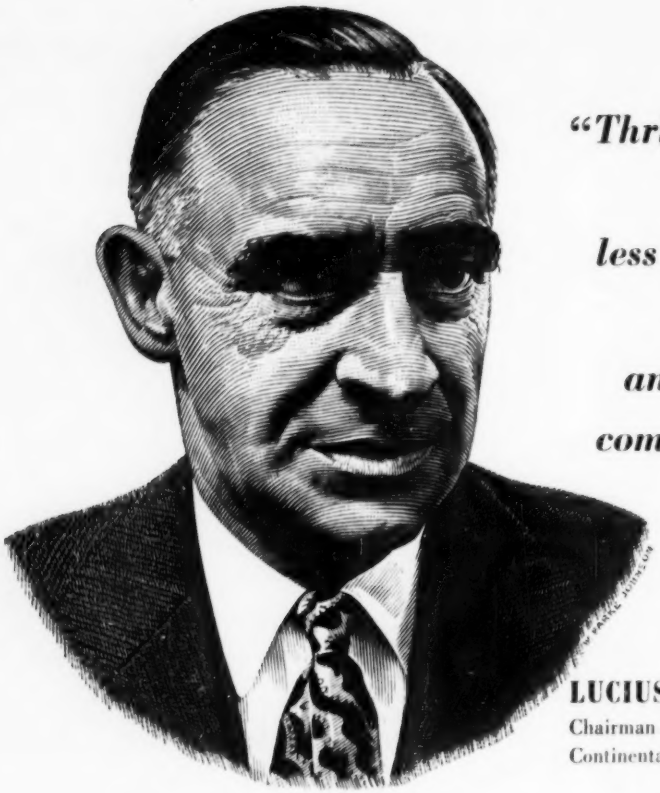

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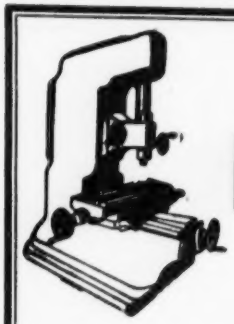

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WANTED BY growing manufacturer of investment castings in southern New Hampshire. Man 20-30 with engineering background. Degree not essential, but knowledge of machine work and castings preferred. Will work in Quotation Department and handle inside sales. Salary commensurate with ability. All replies confidential. Write for interview and further details. P-9787, American Machinist.

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COMPRESSOR, Ingersoll Rand ER-1, 10 HP, M.D.
COMP., 15 HP, 10 HP, Gardner Denver, M.D., New.
COMPRESSOR, C-P 60 HP. M.D., 10x10, 278 CFM.
CRANE, OET Rieker 2 tons 11'9" span.
CRANE, Canton #8 Portable Gooseneck 3 ton cap.

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RADIAL DRILL, 3'11" Canedy-Otto, M.D., Late.
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RADIAL DRILL, 30" Walker Turner M.D., Late.
DRILL, Foedick 16", S.S. Power Feed, M.D.
DRILL, #2 Colburn H.D. #4 M.T., M.D.
DRILL, #121 Baker Auto. S.S. Cam Operated.
DRILL, Deep Hole, Avey-Draulic #2 M.D.
DRILL, Edlund #2B, 3 spdle. #2 M.T., 16".
DRILL, 6 Sp. Avey 12" overhang. #3 M.T., M.D.
DRILL, Cincinnati 21" with Tapping Attach. M.D.
DRILL, 21" Cinci. Bick Super Serv. Box Col.
DRILL, Natco Multiple Spdle C5, 10 Sp. M.D.
DRILL, Natco Multiple Spdle #12, #1 M.T., M.D.
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DRILL PRESS, #2MS Buffalo Forge single spindle.
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GRINDER, #1 Wilmarth Merman Hand Surf., 6"x12".
GRINDER, #2 Imperial Univ. Tool & Cutter, New.
GRINDER, #2 Brown & Sharpe Sur. 6"x18" cap.
GRINDER, #2 Cinci. Centerless Filmatic, Late Type.
GRINDER, #4 G & L Univ. Tool & Cutter, M.D.
GRINDER, Disc, Besly #205, 16" Dble End.
GRINDER, Heald Rotary #25, M.D., 16" Cap.
GRINDER, Cylindrical, Norton 10"x24", M.D.
GRINDER, Brown & Sharpe #4 Univ. 12"x60".
GRINDER, Thread, Jones & Lamson #TG-615, Late.
GRINDER, Heald #72A-3 Internal Size-Matic.
GRINDER, 14"x36" Pratt & Whitney Vert. Sur.
GRINDER, Pratt & Whitney 22"x84" Vert. Surface.
GRINDER, Greenfield #12 Int. Hydromatic, M.D.
GRINDER, Oliver Auto. M.D. Drillpointer, #51.
GRINDER, #33 Abrasive Vert. Auto. Surface, M.D.
GRINDER, #22 Heald Horiz. Rotary Surface, M.D.
GRINDER, Diamond Snagging 10 HP, 24"x4¼".
GRINDER, Norton 6x18 Vert. Surface, Hyd. Late.
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GRINDER, 6"x18" Norton Hyd. Horiz. Surface, M.D., Late type.
GRINDER, Landis 6"x18" Cyl., M.D.
GRINDER, Sellers Type #1A Tool, 24" wheel.
GRINDER, 37" Wheel Dia. Osterholm Disc. 24" cap.
GEAR LAPPER, #8LS, #13LSU Fellows, Outboard Supports, Detachable Laphead, Late.
GEAR SHAPER, Fellows #6 High Speed, M.D.
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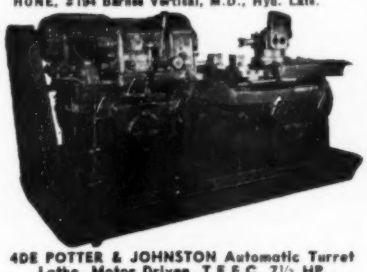
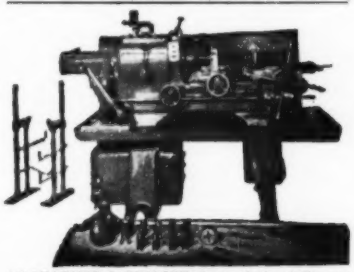
HAMMER, Reebotor Hispeed, all sizes, M.D.
HAMMER, Bradley 2000# Rubber Cushioned Helve.
HEADER, Manville #1 S.S.D.D. Cold 3/16".
INDUCTION HEATER, 16 KVA Ecco HI Frequency.
INDUCTION HEATER, 30 KW Lepel, Late Type.
AIR MOTOR HOIST, Ingersoll Rand 2000# cap.
ELECTRIC HOISTS, 500-4000 lbs. Whiting, NEW.
HONE, #194 Barnes Vertical, M.D., Hyd. Late.



4DE POTTER & JOHNSTON Automatic Turret Lathe, Motor Driven, T.E.F.C. 7½ HP. 3/60.220/440.

KEYSEATER, #3 Mitts & Merrill, Giant, M.D.
LAPPER, 2F Norton Vert., M.D., late type.

2—No. 7 BARDONS & OLIVER Geared Head
Full Universal Turret Lathe, Preselector Head. Bar Feed 2½" cap. capacity through spindle. Late Type, Motor Driven with tooling.



#2 WARNER & SWASEY Geared Head Turret Lathe, 12 Spindle Speeds, Bar Feed.

LATHE, Lo-Swing 8"x100", M.D., A.C. Rebuilt.
LATHE, Porter-Cable 9"x15" Geared Head Prod.
LATHE, #6 WSL Reid Smallpiece Prod., Late Type.
LATHE, LeBlond 14"x6', Q.C.G., M.D.
LATHE, Handey 14"x8' Q.C.G. Taper Attach, M.D.
LATHE, American 18"x6' Q.C.G., Grd. Hd. M.D.
LATHE, Lobman 18"x7' Q.C.G., M.D.
LATHE, American 18"x10' Q.C.G., Grd. Hd.
LATHE, South Bend 18/28"x8' Gap Bed, Q.C.G. M.D.
LATHE, Reed-prentice 20"x10' Grd. Hd. M.D.
LATHE, 20"x16' Reed Prentice Grd. Hd., Late Type
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LATHE, 24"x12' Boye & Emmes Grd. Hd., T.A., Late
LATHE, Putnam 23/32"x12' Q.C.G., M.D.
LATHE, LeBlond 24"x14' Q.C.G., Grd. Hd.
LATHE, Lodge & Shipley 26"x14', Q.C.G., M.D.
LATHE, Bridgeford 27"x12' Geared Head, M.D.
LATHE, 27"x16' Niles Timesaver, Grd. Hd., M.D.
LATHE, Bridgeford 32"x10' Q.C.G., Grd. Hd.
LATHE, 42"x10' Pittsburgh Geared Head, M.D.
LATHE, Bullng Dble. End #VMT5, Devine Bros.
LATHE, Turret #1 Bardons & Oliver Electric Head.
LATHE, Turret, #2 Simmons Vari Drive 220 V.
LATHE, Turret #2 W & S Univ. Grd. Hd., Late
LATHE, Turret, #4 Warner & Swasey Univ. 1½".
LATHE, Turret #5 Warner & Swasey Univ. Late.
LATHE, Turret #6 Warner & Swasey Grd. Hd. Ram Type, Bar Feed, Motor in base.
LATHE, Turret #2 Cinci. Acme Univ. Geared Head.
LATHE, Turret #3A Warner & Swasey Univ. M.D.
LATHE, #501 Oster Hand Turret, M.D., Late Type.
LIFT TRUCKS, 1 & 2 ton, Platform & Fork.

MILL, #1-14 Kent-Owens Hyd. Late Type.
MILL, No. 1 U. S. Hand Mill, M.D. Late.
MILL, No. 1½ Milwaukee Plain Horiz.
MILL, #2 Kempsmith Maximiller Horiz., Vert. Hd
MILL, #0-8 Cinc. Vert. Prod. Rotary Table.
MILL, 2E Cincinnati Univ. Horiz. M.D.
MILL, #3B Brown & Sharpe Vertical, M.D.
MILL, #3B K & T Horiz., M.I.B.
MILL, #3B K & T Vert. M.D.
MILL, #3VB Hardinge Vert. Bench, M.D.
MILL, #4B Brown & Sharpe H.D., Horiz. M.D.
MILL, #14 Garvin Plain Horiz., M.D.
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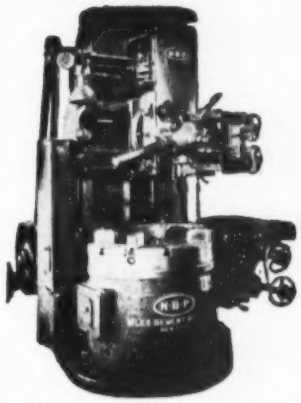
MILLING MACHINE, Kempsmith #2 Horiz. Univ.
MILL, #3 Cinc. Univ. Horiz., M.D.
MILLING MACHINE, LeBlond #4 Horiz. Univ.
MILL, #2 Vert. M.D. Brown & Sharpe.
MILL, #3 Cinci. Vertical HI Power, M.D.
MILL, #5C Becker Vert. Die Sinker, M.D.
MILL, 42"x16"x12" Ingersoll Planer Type, 4 hds.
MILLING MACHINE, #2 Van Norman Duplex, M.D.
MOTOR GENERATOR SET, Gen. Electric, 100 K.W.
NIBBLER, #136 Savage 36"x3/16" Cap., M.D.
NAILING MACHINE, No. 18—48"-54" Morgan, Late.

THREADING, Staybolt Lassiter Millholland 1½".
THREAD MILL, 7⅛x11 Hanson-Whitney, Univ.
THREAD MILL, 6x14 Pratt & Whitney No. 1105.
THREAD MILLER, Plan-O-Mill #3 Planetary Form & Thread Semi-Automatic Milling Machine, Late.



36" x 44" Niels Vertical Boring Mill, Side Head, Motor Driven.

#40A Lees-Bradner Automatic Chucking Thread Mill. Motor Driven, Late Type.

PAPER SHREDDER, No. 10 Mitts & Merrill, M.D.
PLANER, Cincinnati 30"x30"x12" A.C., M.D.
POWER PRESS, Bliss #184 Open Back, M.D.
POWER PRESS, Bliss #3A S.S. Dble. Crank Grd. 45 tons, 4" stroke, 36"x26" Bed Area, M.D.
POWER PRESS—Bliss-Consolidated #165-B Straight Side Dble. Crank 45 tons, M.D.
PRESS, D72 & DG73 Ferracute, Redraw, M.D.
PRESS, #2½ & #5 Toledo, OBI, Motor Driven.
PRESS, #5 Johnson OBI, 56 tons, new.
PRESS, #7 & #8 Johnson OBI 79 & 90 tons, New.
PRESS, #59½ Toledo Str. Side, M.D., 440 tons cap.
PRESS, 70H & 125PA Drake Hyd. Arbor, New.
PRESS, #78½ Bliss Str. Side, 400 ton cap. M.D.
PRESS, Bliss #19, #19, #20, #21, OBI, A.C., M.D.
PRESS, Waterbury-Farrel High Speed 60 tons #3W.
PRESS, 68 C Bliss Double Action, 3 crank.
PRESS, Lucas 15 tons Power Arbor, M.D.
PRESS, #68 Whitney Deep Thr. 24", foot.
PRESS, P2, P3 Ferracute M.D. Roll feed.
WHEEL PRESS, 600 ton Niles-Bement-Pond, A.C.
PANTOGRAPH, #1A Gorton M.D. Engraving.
PUNCH, #46 Buffalo Forge Vert. Cap. 1"x1½" M.D.
PUNCH, R-4 Wiedemann Turret, 10 Stat. 24" thr.
PUNCH, Hooker Turret, 8 station, cap. 2½" hole.
PUNCH, H & J #2 Sgle. End. 24" Thr. 1" thru 1".

RIVET SETTER, #140 Chicago M.D., ¼" cap.
ROLLS, #1 Buffalo Forge Wrapping, M.D.
ROLLS, #1, #2 Buffalo Forge Vert. Angle Bending.
ROLLS, 72"x¼" Lewn Initial M.D., New.

COLD SAW, Wagner 10"x10" cap., M.D.
COLD SAW, Espen-Lucas #760, 48" dia. blade, M.D.
CUT-OFF SAW, Radlas "1" Dobanno.
CUT-OFF SAW, Yates-American #M-90, M.D.
SAW, #8 Marvel Bandsaw, 18"x18" cap.
SAW, #4B Marvel Hack Saw 6"x6" Cap., M.D.
SAW, #20-C Racine Shear Cut 6"x8" cap., M.D.
SAW, 10"x10" Racine Hyd., Late Type, M.D. #30C.
SAW, Band Tannewitz GH-36" High Speed, M.D.
SAW V-26 DoALL Bandsaw, Late.
SHAPER, 16" Newark, Vise, M.D.
SHAPER, 20" Gould & Eberhardt V-ways, Vise, M.D.
SHAPER, 16" Pratt & Whitney Crank, M.D.
SHAPER, 28" Rockford Univ. M.D., Tilting Table.
SHAPER, 32" Cinci., B.C., Motor Driven, H.D.
SHAPER, Morton, 36" Draw-Cut, 4 speed M.D.
SHEAR, 9' x 14 ga. Parker M.D., Late Type.
SHEAR, #28 Buffalo Forge Slitting Armor Plate.
SHEAR, Quickwork #11 Rotary 60" Throat, 10 ga.
SCREW SLOTTER, #2 Waterbury Farrel Auto.
SLOTTER, 12" New Haven Vertical M.D.
SPOTTER & SCRAPER, Anderson Power Unit, Late.
SPRU CUTTER, Milwaukee 56 tons, 2½ cap., M.D.
SURFACE PLATES & TABLES, all sizes.
TAPPER, #1 Cam Hoskins, Motor Driven, Late.
TAPPER, #1 Bakewell (Warner & Swasey) Late.
THREAD ROLLER, #20, #30 Waterbury Farrel.
TRUCK, 2000 lbs. Hyster Fork Lift 9' Model GT-20.
TRUCK, 4000 lbs. LT-44 Towmotor Fork, Lift 9'.
SPINELL TESTER, Type 88DR, Steel City.
WELDER, 300 amp. Westinghouse Flowers A.C.
WELDER, 300 & 400 amps. Gen. Elec. Portable Arc.
WELDER, 75 KVA Federal M.D., Spot.
WIRE STITCHER, Morrison & Aems, M.D.

OVER 2000 MACHINE TOOLS AVAILABLE IN STOCK

RELIABILITY has been earned by WIGGLESWORTH MACHINE TOOLS

AUTOMATICS
1¾" Model G Gridley, 4 spdle.
2⅝" Cone 4 spdle., well equipped, 1936
¾" Model F Gridley, 4 spdle.

BORING MILLS
#25RT G & L horiz., 1947, std. equip.
3½" Cinn. Gilbert floor type, late
24" Bullard New Era, rail & side head
36" Bullard New Era, rail & side head
42" Bullard New Era, rail & side head

GRINDERS
#2 Cinn. Centerless, Filmatic, thru feed
10x36" Norton type C, mech. infeed, late
#444 Van Norman rotary surface, 22" dia.
#76RA Rogers knife grinder, 76", late
#4 Bryant Internal, auto. sizing
14x36" Norton C semi-auto., cyl.
73 Heald Internal Centerless
P & W deep hole drill grinder, late
Model 1311 P & W contour, late

DRILLS
4'11" Canedy-Otto radial, 1¾" cap., late
Type 14 Natco, 12 spdle, #4 M.T., inline head
#12 P & W, 9 spdle, #2 M.T., power feed
D-4 Colburn, #5 M.T., 3½" cap., 24" swing
Baker Hvy Dty, #5 M.T., p.f.
#2LMS Leland-Gifford, 26", hydraulic
#2 Allen, 2, 4, 6 spdle., #2 M.T.

GEAR MACHINERY
60BM G & E cutter, 3 spdle., late
7A Fellows, shaper high speed, hvy duty
61A Fellows, shaper, high speed precision

LATHES
Connel Dengler spinning, 20" swing, 15 HP
14x36' Carroll-Jamieson, g.h., chucks, 1942
18"x46" Monarch 8 speed g.h., taper
42"x26' ctrs American, High Duty, 16 speeds
30"x10' American geared head, taper att.
48"x35' LeBlond Hvy Dty, taper, late
Gisholt Simplimatic, platen type, late

TURRET LATHES
#3 J & L Univ. bar feed, 2" hole, late
#5 B & O Univ., chuck, pre-selector, late
#1A W & S Univ., 3" hole, #417,756
#1L Gisholt Universal, 3" hole, 1937
Libby type H, 24" swing, 8 spdle, speeds
#2 Simmons Microspeed, air chuck, late
#3 Gisholt Universal, late
#4 W & S, bar feed, serial #342461
#4A W&S Univ., cross sliding turret, 1944

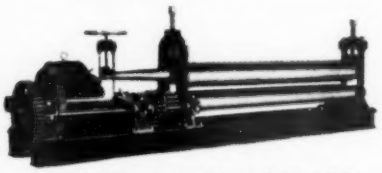
SHAPERS & PLANERS
48x48x14' Detrick & Harvey dble. hsg.
48x48x16' Liberty openside, p.f.
26" Smith & Mills shaper, 4 step cone

MILLS
#12 B & S auto. prod., 5 HP, late
#3 B & S vert., s.p.d.
08 Cinn. horiz., rise & fall, 1943
08 Cinn. horiz., auto. cycle, 1943
#1½B K & T horiz., dble. overarm, rebuilt
10C Van Norman Contour
#3 Cinn. high speed dial type, vertical
#5B B & S horiz., round overarm, 16 speeds

THREADERS
#22 Murchey bolt & pipe, ½ to 2", late
8x16' Hanson-Whitney Universal, mill, late
6x80" P & W miller, splining & milling
#50 Excello Precision grinder, 28x68"
13" Automatic Machinery miller, late
LT636 Lees Bradner mill, 18x36", late
1½" Landis, 2 spdle., lead screw type
#31 Excello, diamond dresser, late

PRESSES
#37 Excelsior dble. crank, 45 ton
250 ton Elmes hyd. shell nosing, 21½" str.
Ferracute type EG-52 embossing, 150 ton
#4 Toledo OBI, 25 ton. 2" stroke

MISCELLANEOUS
WELDER: "Una" Submerged arc, 400 amp. with welding positioner.
MAGNAFLUX: MA-3 production type, 3000 amp.
WELDER: 75KVA Thompson Gibbs spot, 18" throat
WELDER: 250 KVA Federal spot, air, late
TUBE BENDER: R-48 W & W hyd., 1¼", late
TAPPERS: Haskins 2CAM, 5/16" late Cleve. Model EO, ½", late
WELDERS: Hobart and P & H Arc, 400 amp.
BULLDOZERS: #2 Ajax High Speed, 30 ton
SAW: 34" Espen-Lucas, 1945



20'x1'' Wickes Pyramid Type Bending Rolls, 20'' upper roll, 14'' lower, power adj.

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Since 1920 we have Served Allis-Chalmers—A. O. Smith—Harnischfeger—Kearney & Trecker—Nash-Kelvinator—Harley Davidson and many others. We are well known throughout Wisconsin and the mid-west and—for all your machine tool needs we are as near as your 'phone.

BORING MILLS
BULLARD 42" Vertical Boring Mill; ser. #14,777; side head; M.D.
BULLARD Type "A" 8" Mult-Au-Matic; 6-spdl; serial #10884; M.D.

DRILLS
LELAND-GIFFORD No. 2LMS 2-Spindle; hyd. picker type feed; M.D. (Late).
BARNES 24" All-Geared; Self-Oiling; M.D.; Single Spdl.
DELTA 4-Spindle 17" Drill; power feeds; M.D.

GRINDERS
TAFT-PIERCE No. 1 Precision Surface Grinder; 6 x 12"; tilting head; M.D. (Late).
ARTEK Model A-12 Rotary Surface Grinder; 14" chuck; M.D.
BLANCHARD No. 16 Surface Grinder; 26" chuck; M.D.
HAMMOND 14" Carbide Grinder; M.D. (Late).

LATHES (Turret)
JONES & LAMBSON #4 Univ. Geared Head; bar feed, collets; chuck; lots of tooling; (LIKE NEW).
GISHOLT No. 4 Univ. Geared Head; preselector; M.D. (1942 mfg.).
SIMMONS No. 9 Micro Speed; geared; M.D. (Like New).
FOSTER No. 3B Saddle type; 5" spindle; M.D.; Geared Head; tooling.
WARNER & SWASEY No. 1 Hand Turret Lathes; bar feed; M.D. (1941 mfg.).

MILLS
BROWN & SHARPE No. 2B Horizontal Mill; late model; vertical head.
VAN NORMAN No. 12 Univ. Horiz/Vert. Mill; M.D. (Late).
VAN NORMAN No. 1-18 Production Mill; M.D. (LATE).
KENT-OWENS No. 2-RV Hand Mill; M.D. (LATE).

PRESSES
BLISS No. 103-A Double Crank; str. side gap frame; 2" stroke; bolster 14" x 42"; M.D. (1944 mfg.).
TOLEDO No. 201-E Dbl. Crank Gap Frame Geared; bed 13" x 53"; stroke 3¾".
FERRACUTE No. P-2 Flywheel Press; M.D.
FERRACUTE No. P-3 Flywheel Press; M.D.
ZEH & HAHNEMANN No. 7 Embossing Press; 50-Ton cap.; M.D.
EXCELSIOR No. 20 Deep Throat Press; 20" throat; M.D.
RODGERS 150-Ton 4-Post Hydraulic Platen Type; LIKE NEW.

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3'11" DRESES Radial Drill—Motor on arm
12x30" and 16x8' MONARCH Geared Head Lathes
30"x16' bed AMERICAN High Duty Geared Head Lathe
42"x15' AMERICAN Heavy Duty Lathe
42"x25' centers AMERICAN Heavy Duty Lathe
No. 5A BRYANT Internal Grinder
No. 172 HEALD Gap Internal Grinding Machine for large swing
6"x18" LANDIS Type C Plain Grinder
10"x72" LANDIS Type C Hydraulic Plain Grinder —1942
12x18x40 THOMPSON Type "B" Surface Grinder —1951
Nos. 4D & 6B POTTER & JOHNSTON Automatic Lathes
Nos. 8A and 9A JONES & LAMSON Saddle Type Universal Heavy Duty Turret Lathes
No. 2 CINCINNATI HS Dial Type Plain Millers
No. 0-8 CINCINNATI Plain Milling Machines
No. 2M CINCINNATI Vertical Miller, 1941
No. 1-18 CINCINNATI Plain Mfg. Miller
No. 12 B&S Plain Bed Type Production Miller
6"x60" P&W Model C Thread Miller
Nos. 64 and 72 FELLOWS High Speed Gear Shapers
No. 12 FELLOWS Gear Shaver 1943
No. 36BM GOULD & EBERHARDT Gear Roughr
16/20" GOULD & EBERHARDT Industrial Shaper
36" OHIO "DREADNAUGHT" H.D. Shaper.
100" BETTS Vertical Boring Mill, 2 heads.
50-ton HENRY & WRIGHT Dieing Machine, 1948.

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REBUILT, REPAIRED

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1941-1953 MACHINE TOOLS

IMMEDIATE DELIVERY — NO PRIORITIES NEEDED

CAM MILLERS

VAN NORMAN: 10CT Contour Miller horizontal opposed spindle type for milling flat cams, also can be converted to similar work

CENTERING MACHINES

SWEDISH: Double-End, 42" & 60" new
SUNDSTRAND: Double-End, #53, 24" Centers.

CUTTER & TOOL GRINDERS

ARTER: Carbide Tool Grinders No. 200
CONSTAN: Carbide Tool Grinder No. 178, new
FELLOWS: Flat Top Helical Gear Cutter Grinder
OLIVER: 10" Template Tool Bit
RANSOM: 2-Wheel Grinder 3 HP
RUSSELL: 40" Saw Sharpener (New) automatic indexing

DRILLING MACHINES

ALLEN: No. 2 Drill—6 Spindle
ALLEN: #2 High Speed 15" overhang
PRATT & WHITNEY: ½B x 50 Deep Hole Drilling & Reaming Machine, 2-spindle
RADIAL DRILLS: Archdale, 5', 6' and 7', new

GEAR CUTTING MACHINES

FELLOWS: 64A Shaper, 18" dia.
FELLOWS: Flat Top Helical Gear Cutter Grinder
FELLOWS: Straight Line Generator, 3" dia. with many cutters
GLEASON: #12 Rough & Finish Gen.
GLEASON: 3" Straight Bevel Gear
SYKES: Gear Shaper 14" external, 20" internal (New)
SYKES: Rack Cutting Machine 12" to 36" length capacity (New)

GEAR AND SPLINE GRINDERS

PRATT & WHITNEY: 10" single and double wheel, hydraulic feed
GEAR GRIND MACH: GG-19, 10" x 24" Hydr. Spur Gears and Splines
INTERNAL GEAR GRINDER, GG-31

GEAR FINISHERS & TESTERS

FELLOWS: 8 LSI and 13 LSI Gear Lappers, external and internal spur and helical
FELLOWS: #12C Cone & Spacing Inspection Instrument
GLEASON: No. 3 Bevel Gear Tester
GLEASON: No. 4 and No. 6 Bevel Gear Testers. Hand and Power
NATIONAL BROACH: SIC-12" Red Ring Gear Testing Machine

GRINDERS—CYLINDRICAL

BROWN & SHARPE: No. 10 capacity 6"x18" plain
CINCINNATI, 6"x18" Hydraulic, Plain
LANDIS: 16x32" Type "D" Crankpin, hydraulic, for grinding crankshafts
NORTON: 10"x18" 45° angle wheel

3-WAY GUARANTEE

1. Should any machinery purchased from us prove unsatisfactory, you can return the machines within 30 days, via freight prepaid to our plant, and a full refund will be made.
2. Machines at our plant can be demonstrated and tested under power before purchasing.
3. You are dealing with a well-established, highly-rated firm of machinery engineers with over 33 years of proven responsibility.

GRINDERS—GEAR & SPLINE

GEAR GRIND MACH.: GG-19, 10"x 24" Hydr. Spur Gears and Splines
PRATT & WHITNEY: 10" single and double wheel, hydraulic feed
INTERNAL GEAR GRINDER, GG-31

GRINDERS—INTERNAL

BRYANT: 16-16 Internal Hydraulic
BRYANT: No. 5Y Internal
HEALD: 72A3 Sizematic Centerless
HEALD #73 Centerless Internal Grinder

GRINDERS—RADIUS

VAN NORMAN: #73, capacity 7½"
VAN NORMAN: #649-16, capacity 6" to 16" diameter
VAN NORMAN: #3½ Un. Radius

GRINDERS—THREAD

EXCELL0: #31 External, dia. 5"x18"

HONING MACHINES

MICROMATIC: H-510 Double End Horizontal, ¾" to 2" dia.
MICROMATIC: H-2 Single End Horizontal, 2 spindle, ¼" to 1" dia.

LAPPING MACHINES

FELLOWS: 8 LSI and 13 LSI Gear Lappers, external and internal spur and helical

LATHES PRODUCTION

BLOUNT: Polishing speed lathe 12" dia. x 48" centers
H.E.B.: High production hydraulic duplicating and copying lathes (new)
LODGE & SHIPLEY: #3A Duomatic, 25½" swing x 27" centers
TRIPLEX Tool Room Lathe, 14"x60", new

LATHES—TURRET

WARNER & SWASEY: 1A & 3A
WARNER & SWASEY #3 & #5
HERBERT: #0, #2, #4, #7, #8 and #9B/30 Sizes, new
WEBSTER & BENNETT: Vertical Turret Lathes 36" & 48" (New)

MILLING MACHINES

TAYLOR-FENN: M-80 Duplex Spline
RICE-BARTON: 4" Twin Spline
VAN NORMAN: 10CT Contour Miller, horizontal opposed spindle type for milling flat cams, also can be converted to similar work

SAWS & CUT-OFF MACHINES

RUSSELL: 9½" cut-off Saw with Auto. Stock Feed (New) Hydraulic
RUSSELL: 5½" dia. cut-off saws, auto stock feed, hydraulic (New)
MOTCH & MERRYWEATHER: No. 3 Circular Saw with auto. stock feed

THREAD MILLERS & TAPPERS

HALL PLANETARY: Model "D" Thread Miller
LANDIS: 2½" single head horiz. threading machine
LEES-BRADNER: #40A Thread Miller
LEES-BRADNER: CT-36 Thread Miller chucking type, 13½" hole
MURCHEY: #22 Horizontal threading and tapping machine, ½" to 2½" dia. capacity, single spindle
NATCO: Vertical Tapper 16 spindle

WIRE FORMING MACHINES

HEENAN & FROUDE 4-slide machines, new
HEENAN & FROUDE Paper Clip & Staple Machs., new
Nilson #1F, 4-slide wire forming

MISCELLANEOUS

ARTER CARBIDE Tool Grinders, No. 200
OPTICAL PROFILE GRINDER, Wickman, New
OPTICAL PROFILE GRINDER, Sheffield, used
AUTOMATIC SCREW MACHINE, Swiss type, ⅜"—used
AUTOMATIC SCREW MACHINE Wickman, Single Spindle, 7/16", New
RACK CUTTING MACHINE: Sykes 12" to 36" length capacity (New)
CUT-OFF: Russell 5½ & 9½" cut-off saws with auto. stock feed (new) hydraulic
TEST STAND: Denison 918-AM Hyd.
LATHES: Blount Polishing Speed Lathe 12" dia. x 48" centers
HARDNESS TESTER: Gogan Brinell, Model 16-8
SHEFFIELD Precisionaire Gauge
CENTERING MACH., Swedish, Double-End, 42" & 60", new
SUNDSTRAND: Double-End, #53, 24" Centers Centering Mach.
WIRE FORMING MACHINES: 4-slides (new)

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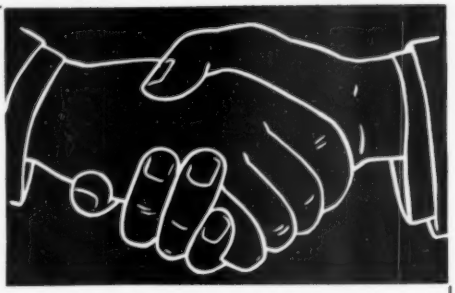

● There's a feeling of sincerity in a good firm handshake. Likewise, there is a mutual feeling of sincerity in all dealings users of used and rebuilt machines have with Motch & Merryweather.

This feeling of confidence stems from our policy of fair dealing since we started rebuilding machine tools in 1904.

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Our close adherence to this policy has definitely proved its value in the large number of repeat orders we have received over the years from recognized manufacturers in the metal working industry.

Play safe—contact Motch & Merryweather first on your used and rebuilt machine tool requirements.

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CLEVELAND DETROIT
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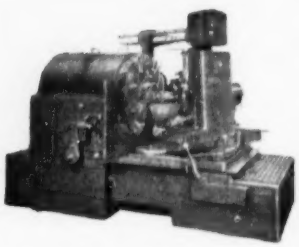
LAURENS late models



No. 17 GLEASON Spiral & Hypoid Bevel Gear Grinder, 1944 Machine hardly used, and in condition like new; with automatic wheel dressers.

LISTED BELOW IS A GROUP OF THE MANY FINE GEAR MACHINES, LATHES AND BOREMATICS IN STOCK:

2—KOEPFER Precision Gear and Pinion Cutters, up to 2" diameter, Model WM 1.

1—No. 61A FELLOWS Gear Shaper, Ser. No. 22198

1—12" GLEASON Combination Rougher and Finisher for straight bevel gears, hydraulic chucking, Ser. No. 15459.

1—10" PRATT & WHITNEY 2-wheel Helical gear grinder, Ser. No. 204

4—No. 18 GLEASON Formate Hypoid Gear Grinders, like new, Ser. Nos. over 22,000, new 1947

1—12"x30" cc LEBLOND Heavy Duty Toolroom Lathe, Ser. No. NB-201

1—Model U SENECA FALLS Lo-Swing 14"x 24" centers Automatic Lathe, Ser. No. 25U-5355

1—20"x25" JONES & LAMSON "FAY" Automatic Lathe, with air chucking, Ser. No. 80855

2—Model 616 CLEVELAND Rigidturners, like new; Ser. Nos. 88T-38 and 88T-46

1—#45 HEALD Single End Boromatic Serial No. 14218. Can be arranged for double end.

1—#46 HEALD Double End Boromatic, New 1933 with four boring heads. Priced only at $2350.

Telephone REdwood 3500

Ask for Stock List #953-A

Machine Tools
LAURENS BROS., INC.
2780 HIGHLAND AVE
CINCINNATI 12, O

LATE TYPE MACHINE TOOLS

No. 41 Lucas Horizontal Boring Mill. 1941.

HP-100 LaPointe Horizontal Hydraulic Broach. 1945.

No. 7 Gleason "Revex" Gear Rougher. 1943.

14"x48" Norton Univ. 1942.

No. 35 Excello Precision Thread Grinder.

No. 2 Cincinnati Centerless Grinder. 1944.

24-36-Bryant Hydraulic Internal Grinder. 1942.

No. 72A3 Heald Plain Hydraulic Internal Grinder. 1941.

No. 24 Mattison (Hanchett Type) Duplex Grinder.

No. 16A Blanchard Automatic Surface Grinder. 1942.

No. 6DRE Potter & Johnston Automatic. Late.

27"x192" Niles "Timesaver" Engine Lathe. 1941.

No. H5 Libby Universal Saddle Type Turret Lathe. 1939.

No. 3R Gisholt Universal Saddle Type Turret Lathe. 1942.

No. M-18 Kearney & Trecker Simplex Mill. 1943.

650 Ton Verson Double Action Eccentric Press. 1940.

Ask for Current Stock List

Indianapolis MACHINERY & SUPPLY CO.
1961 SOUTH MERIDIAN STREET
INDIANAPOLIS 6, INDIANA

Eastern Rebuilt Machine Tools

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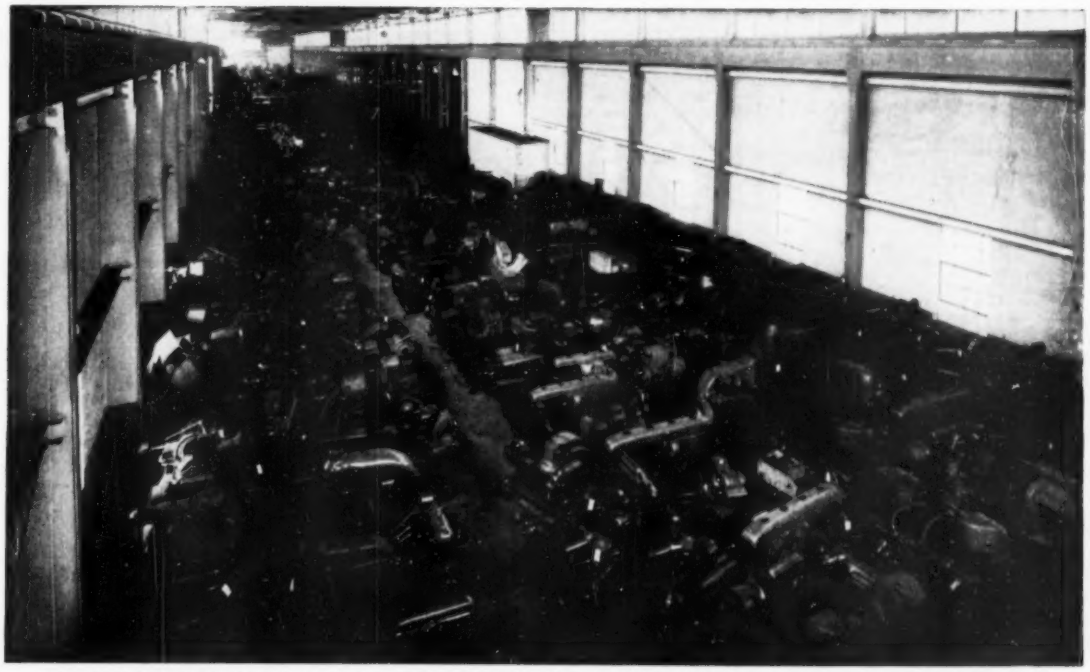

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ENGINE LATHES

14"x30" centers Bradford, timken
12" Bradford, 14½" swing x 30" centers, Timken
12"x6' Lodge & Shipley Geared Head, m.d., taper
13"x54" centers LeBlond Geared Head, m.d., taper
13"x5' bed Willard, cone, motorized
14"x6' American High Duty Geared Head, m.d., taper
14"x16' Hendey Geared Head, m.d., taper
14"x6' Lodge & Shipley Geared Head, m.d.
14"x6' Lodge & Shipley, cone, motorized
14"x6' Pratt & Whitney, cone
14"x6' LeBlond, cone
14"x6' LeBlond, Geared Head, s.p.d.
14"x6' bed Monarch, cone, motorized
14"x6' Sidney Geared Head, m.d.
14"x6' Springfield Geared Head, m.d., taper
14"x8' Sidney Geared Head, m.d.
14"x8' Prentice, m.d., taper
16"x30" centers Monarch, m.d., taper
16"x6' bed Cisco Geared Head, m.d.
16"x6' Hendey Geared Head, m.d.
16"x6' Hendey Yoke Head, taper
16"x6' Lehmann Geared Head, m.d.
16"x6' Lodge & Shipley Selective Head, m.d.
16"x6' Lodge & Shipley, cone
16"x6' bed Monarch Geared Head, m.d.
16"x72" American Geared Head, m.d.
16"x84" Pratt & Whitney Type B, m.d.
16"x8' bed Reed-Prentice, cone, taper
16"x8' Monarch, cone, motorized
16"x12' bed LeBlond Geared Head, m.d., taper
17"x6' LeBlond Geared Head, m.d.
18"x5' LeBlond Geared Head, m.d.
18"x6'6" bed Greaves-Klusman Geared Head, m.d.
18"x7' Hendey Geared Head, m.d., taper
18"x8' bed American Geared Head, m.d.
18"x8' Hendey Geared Head, m.d., taper
18"x8' Lodge & Shipley Geared Head, m.d.
18"x8' Whitcomb-Blaisdell Geared Head, s.p.d.
18"x8'6" bed Walcott, cone, motorized
19"x6' bed LeBlond Geared Head, m.d., later type
19"x10' bed LeBlond H.D., m.d.
19"x10' bed LeBlond H.D., m.d.
19"-38"x10' bed LeBlond Gap Lathe, cone, motorized, taper
20"x8' bed American Geared Head, m.d., taper
20"x8' Cisco, cone, motorized
20"x8' bed Greaves-Klusman Geared Head, m.d. in leg
20"x8' bed Boye & Emmes, m.d.
20"x8' bed Lodge & Shipley Geared Head, m.d., taper, later type
20"x10' bed (6' centers) Sidney Geared Head, m.d., taper
20"-40"x9' bed Rahn-Larmon Gap Lathe, cone, motorized
20"x10' Sidney Geared Head, m.d.
20"x10'6" Boye & Emmes, cone, motorized
20"x10'6" bed Sidney "Tritrol" Geared Head, m.d., late
21"x8' bed LeBlond Geared Head, m.d., taper
23"x12' LeBlond Geared Head, m.d., taper
23"x12' bed LeBlond, cone, motorized
24"x12' bed Boye & Emmes, belt drive
18-27"x8' Nebel Removable Block Gap Series LN Geared Head, m.d.
24"x7' centers American, m.d.
24"x12' Bridgeford Geared Head, m.d., taper
24"x16' bed Lodge & Shipley, cone, motorized, taper
24" raised to swing 32"x22' bed—16' centers New Haven, cone, taper
25"x10' bed LeBlond Geared Head, m.d., taper
27"x24' bed American Heavy Duty Geared Head, m.d., taper, late type
30"x12'6" bed Niles-Bement-Pond, variable speed m.d., taper
30"x40' bed (33' centers) Betts-Bridgeford Heavy Duty Hollow Spindle, "Oil Country" type, m.d.
30"x13'6" bed Niles-Bement-Pond, m.d.
36"x84" centers American "Super-Productive", m.d.
36"x16'6" bed Boye & Emmes Geared Head, m.d.
36"x18' Putnam, m.d.
42" Putnam raised to swing 56½ x 20' bed Geared Head, m.d., 11'8" centers
42"x180" American Super-Productive Lathe, m.d., taper
48"x33' centers Niles-Bement-Pond, m.d.
72"x7' centers I. H. Johnson
42"x186" centers LeBlond Heavy Duty Geared Head, m.d., taper, late type

MANUFACTURING LATHES

#12 Gisholt Automatic Production Lathe, m.d., late
12x18" Reid Small Piece Production Lathe, Model 6WSL, m.d.
No. 3 Lodge & Shipley Duomatic, m.d., late type
No. 3A Lodge & Shipley Duomatic, m.d., late type
Model B1—½ H.P. Blount Speed Lathe, m.d.
W. C. Lipe Carbomatic, m.d.
Colburne Mfg. Bench Type Speed Lathe, m.d.
No. 4 LeBlond Boring Lathe, 37' bed, 4" hole, m.d. latest
No. 9, 12 LeBlond Multi-Cut, m.d.
4x60" LeSwing, m.d.
8x132" LeSwing, m.d., latest
9x12" Sundstrand, s.p.d.
11x18" LeBlond Rapid Production, m.d.
12x18" centers Monarch Model 5T, m.d.
Schauer Type NA 2B Speed Lathe, m.d., latest
30x10" LeBlond Turning Lathe, cone
12x18" centers Lipe-Carbo Lathe, m.d.
8x108" LeSwing, m.d., taper, latest

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Hand Milling Machine—No. 1 U. S.

UNIVERSAL MILLING MACHINES

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10 ton 56" Oilgear Model 3Ax horizontal
12 ton V2 American vertical hydraulic
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18 ton V42 American vertical hydraulic

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24" No. 321 Baker heavy duty
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22 spindle No. 14 Natco multiple
34 spindle No. A16 Natco multiple
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20", 21" and 24" Cincinnati upright
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No. 15½ Foote Burt hydraulic vertical
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No. 12H Heavy Gould & Eberhardt universal
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8"-10" No. 1 Lees Bradner
No. 7S Lees Bradner
No. 12 Barber Colman
Type A Barber Colman universal

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No. 60 Cross gear tooth rounder
100" x 24" Newark No. 7
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10" Pratt & Whitney hydraulic gear grinder

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10" x 18" Cincinnati Filmatic bearing
10" x 36" Norton cylindrical
16" x 72" Norton cylindrical
16" x 96" Landis cylindrical
16" x 96" Landis gap type cylindrical
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23" No. 84 Gardner opposed spindle disc
53" No. 24A Gardner horizontal disc
72" No. 179 Gardner horizontal disc
30" No. 8 Badger double disc motor on spindle
No. 72A3 Heald plain hydraulic internal
No. 72A3 Heald Gagematic internal
No. 72A3 Heald Sizematic internal
No. 5 Bryant internal
No. 16A Bryant 2 spindle hole and face
24-36 Bryant internal hole
8" x 22" No. 3 Abrasive surface
12" x 48" Model 300 Hanchett surface
8" x 24" No. 5 Brown & Sharpe surface
No. 4T Sellers tool grinder
Cincinnati face milling cutter grinder
No. 3 Barber Colman hob sharpener
38" Covel Hanchett Model GK-36 knife grinder

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12" Cincinnati plain manufacturing, also 18"
24" Cincinnati duplex automatic
4—36 Cincinnati Hydromatic production
4—48 Cincinnati Hydromatic production
4 Burt universal floor type mill
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No. 3-24 **CINCINNATI** Plain Hydromatic Mill, AC-MD
No. 4 **KEARNEY & TRECKER** Plain Horizontal Mill, No. 50 taper, motor in base, rapid traverse
No. 4 **CINCINNATI** High Speed Dial Type Plain Horizontal Mill, new 1942
No. 4 **CINCINNATI** High Power Dial Type Vertical Mill, 25 HP motor, new 1951
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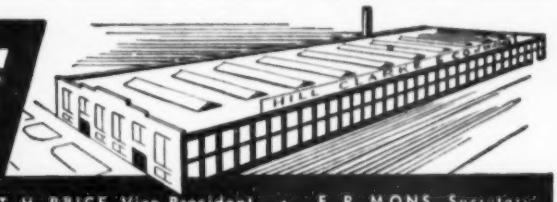

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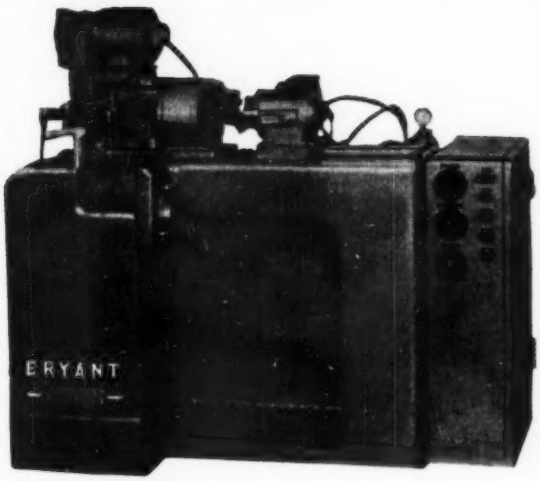

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1 Spdl.—30" Sw.—No. 4 taper Aurora
2 Spdl.—24" Sw—No. 3 Avey
12 Spdl. D-31 Fox, No. 2 Taper

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11" Gleason Bevel Gear Generator
No. 36-BM G & E 3 Spdl, Rougher
No. 612-A Fellows Gear Shaper
No. 615-A Fellows Gear Shaper
No. 64 Fellows Gear Shaper
No. 65 Fellows
8" cap Red Ring Gear Lapper

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6" x 18" Landis (1942)
6" x 18" Norton Cylindrical (1943)
10" x 36" Norton Type C
10" x 36" Norton Type C Cam. Grdr.
10" x 48" Norton type C (1943)
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10" x 72" centers
10" x 96" centers
14" x 36" centers
14" x 50" centers
14" x 72" centers
14" x 96" centers
18" x 96" centers
18"-30" gap x 96" centers
24" x 264" centers
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No. 16 A-28 Bryant Internal Grd.
No. 16 F-28 Bryant Internal Grd.
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No. 24-36 Bryant Internal Grd.
No. 81 Heald Centerless Internal
No. 74 Heald Internal Centerless

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54" Ingersoll Vert. Adjustable Rotary Mill
No. 45—4½" bar G & L Hor. Bor.
100" Niles-B-Pond Vert. Bor., Mill

LATHES

16" x 83" R-14 Seneca Falls Auto. Lathe
18" x 6' American Geared Head Lathe
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19"x8' LeBlond Mfg. Tur. Lathe
27" x 12' American Geared Hd. Lathe
27" x 12' centers LeBlond Lathe
36" x 18' Putnam Grd. Hd. M.D.
5W Acme Ram type Tur., 2" Capacity
No. 6 Warner & Swasey Tur.-Bar Fd.
18" Libby Tur. Lathe, M.D.
No. 3AL Gisholt Cross-Slide Tur.
No. 4A Warner & Swasey—7⅛" Hole Spdl.
No. 4A Warner & Swasey, Taper, (1944)
No. 4A Warner & Swasey, Taper, Cross-Slide (1942)

MILLING MACHINES

No. 3K Milwaukee Vert. Mill (1942)
No. 08 Cincinnati Vert. Mill (1942)
54" x 30" x 16' Ingersoll Slab Mill
6" x 168" Pratt & Whitney Thrd. Mill
10" x 48" Hanson-Whitney (1942)
10" x 60" Pratt & Whitney Thrd. Mill
12" x 102" Lees-Bradner Thrd. Mill

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48" x 36" x 14' Gray, 2 hds.
48" x 48" x 12' Cincinnati, 2 hds.
60" x 48" x 27' American, 4 hds.

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15" Dill Slotter
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Norton 12" x 36" Hydraulic Universal—Internal spindle—MD—late type

Brown & Sharpe No. 3 Universal—Cap. 14" x 40"—MD—Late type

MILLERS

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Milwaukee No. 3H Universal—Range 34" x 12" x 17" — Table 64" x 13½" — Dividing head—MD—Late type

Cincinnati 72" x 54" x 16' Hypro Planer Type—2 rail and 2 side heads—MD

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BESCO 96" x ⅛" Power Squaring Shear; NEW
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NIAGARA No. 160 60" x 18-gauge; late type
QUICKWORK No. 5 Rotary Shear, ⅜" cap. M.D.
QUICKWORK No. 6 Rotary Shear, 1" cap. M.D.
WORMSER T-15 Ironworker; NEW
WORMSER T-25 Ironworker; NEW
WORMSER T-30 Ironworker; NEW

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COLONIAL VG-1-10-48 Vertical, Hydraulic; late
LaPOINTE 10-54" Single ram type; late
OILGEAR 3XA Horizontal, Hydraulic; late

DRILLS, Miscellaneous
ALLEN No. 3, 4-sp., 4 motor dr., No. 4 M.T., late
BARNES No. 420 Deep hole; late
BARNES H2 Hydram, cap. 2", No. 5 M.T., hyd., late
BARNES 20", 4-spindle Camel Back, No. 4 M.T., power feed, late type
CINCINNATI 21" round column, M.D. late
LELAND & GIFFORD No. 1 LMS; late
MOLINE 6-sp. Mult. Hole-Hdg; 3¾" dia. M.D.

RADIAL DRILLS
AMERICAN 5' arm 13" column, Universal, M.D.
AMERICAN 4' arm 11" col. "Hole Wizard" late
CINCINNATI BICKFORD 6' arm 17" col. Plain; late
CINCINNATI BICKFORD 6' arm 15" col. M.D.
KITCHEN & WADE 4' arm 12" column, M.D.

GRINDERS, Internal
BRYANT, No. 3 and 5 internal; hydraulic; late
BRYANT No. 16-C-16 internal; hydraulic; late
BRYANT No. 24 internal; hydraulic; late
CHURCHILL No. 3 Internal; 8" stroke; late
HEALD No. 70A Internal, M.D., late
HEALD No. 81 pl. chuck type, internal; M.D.
HEALD No. 72A3 and 72A5 Plain Internal; late
HEALD No. 72A5 "Gagematic" Internal; late
HEALD No. 78 Internal, centerless, M.D.

GRINDERS, Cylindrical, Plain & Universal
BROWN & SHARPE No. 3 Universal; late type
BROWN & SHARPE No. 5, 3"x12"; Plain; late
CINCINNATI 10"x60" Plain; late type
LANDIS 14"x72" Type "C" Plain Cyl.
LANDIS 10"x18" type "C" Plain; hydraulic; late
LANDIS 16"x36" Pl. Cyl. type "D", Hyd.; late
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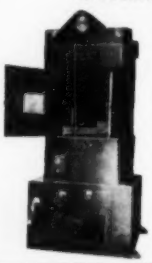

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Brown & Sharpe (1) Model #4
Brown & Sharpe (1) Model 2G, 1¼" capacity.
Brown & Sharpe (8) Model 0G, ⅝" capacity.
Brown & Sharpe (4) Model 00G, ⅜" capacity.
Brown & Sharpe #4 Automatic New 1939
Ceco Screw Machine ⅜" capacity.
Cleveland Model AA-11, Serial #36586.
Cleveland Model B. Serial #42618/843.
Cleveland B18—1½" Cap. Late.
Conomatic 4 Spindle, Serial #2309FF, 1½".

BORING MILLS
Bullard 24" V.T.L. Spiral Drive
Bullard 8"—8 spindle, Multi-Matic
Cleveland 2½" Bar Capacity, Defiance 3¾" Bar
Giddings & Lewis #32, 3" #25, 2½" Bar.
Kings 42", 72" Vertical 2 rail heads
Niles-Bement-Pond 4", 4½" Bar, 60" Vert.
Niles-Bement-Pond 60" Vertical
New 3" Horizontal Boring Mill

DRILLS AND RADIALS
American 6'x15" Universal, 4'13", 3'9"
Baker No. 321 Vertical Boring & Drill
Bausch Multi-spindle
Buffalo #2 Motor Spindle, #16—4 Sp.
Buffalo: Power No. 41, No. 42 RPMSTERS
Canedy-Otto 21" Sliding head, New
Cincinnati Bickford 6'15" col.
Edlund 8" Model 2B, Sliding Head
Natco #12, 20 spindle. Model B2A—10 Sp.
24" Sibley Sliding head
New Geared Box Col. Drills 24"
Foote-Burt #25 3" capacity
Leland-Gifford 2 LMS, 3 MS
Leland Gifford No. 2—4 Sp. Hyd. Feeds
Sigourney 2 spindle

ENGRAVERS
Gorton #ME, 1D, 3U, 3Z, Deckel G1L, G1, G2
Taylor-Hobson 3 dimensional Pantograph
New, 3 dimensional Deckel type

GEAR EQUIPMENT
Barber-Colman Mod. SH5, Sharpener
Barber-Colman #3, #2, #12 (3) also Type S.
Brown & Sharpe #3 Gear Mill, 26" Cap.
Fellows High Speed Shapers 712, 725, 71, 7, 61A
Fellows #20M Redliner, Flather 72" Cutter
Gleason Gear Rougher, Gleason #6 Power Tester
Gleason #2 Surface Hardener, No. 3 Gear Tester
Gleason #3 Spiral, #3 Straight Bevel
Gould & Eberhardt 36" Cutter
Michigan Gear Finisher 24" cap., 862-24A
Michigan 1708 Hob & Cutter 8"x24"
Mikron No. 79 Gear Hobbers
National Broach Red Ring Lapper, Finisher
Schuchardt & Shutte #1 Hobber

GRINDERS, SURFACE
New 9x24" Hyd. Feed 10x18", 6x18"
Abrasive 8x24", #33 Vert. & #34
Brown & Sharpe #5, #2 with Chuck
Gallmeyer & Livingston—65
Heald 22—12" chuck, Arter 12", Covel No. 15
Norton—6x18
Portman 12" Chuck Rotary—Reid #3, 11"x36"
Pratt & Whitney 12x36" Vertical
Taft Pierce #1 Precision

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125 Ton Southwark Press, Bed 96"x30". 30" stroke, 2 to 4 ft. opening
150 Ton Triple Action HPM Press
250 Ton Watson & Stillman 28x24"
300 Ton Watson & Stillman 24x29"
300 Ton Watson & Stillman 20"x20" Platen 8" St. 19" opening
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800 Ton Williams & White 42"x60"
800 Ton W&S Hobbing Press

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Brown & Sharpe #5, 3"x18" Cylindrical
Brown & Sharpe #13 Universal Tool & Cutter
Bryant #5 Internal, chucking
Cincinnati 6x18" Hyd. #4—Centerless—#2
Douglas Tool & Cutter 8"x15"
Gardner Disc Grinder 30"—15 H.P. Motor
Grenby Models 1G1 & 1G2—Internal
Gorton Ped. Type Tool Grinder Mod. 375-2
Heald #73 Internal Centerless, #75A Internal
Heald 72A3 Int. Centerless Sizematic
J. & L. Thread; TG615, Lempco 54" Swing
Landis 6"x30" Type C Cyl., 10x24 Univ. 12x30
Norton #2 Tool & Cutter, No. 1 Tool & Cutter
Norton Type C 6"x18" Semi-Automatic cyl.
Norton 10"x18" Type C cylindrical, 6"x30" Cyl.
Norton 14"x96" cyl. 16x48 Univ.
Norton Roll Grinder 50"x28'
Oliver #510 Drill Pointer
Pratt & Whitney Radius Model R6
Sellers 6-G Drill Grinder, 6G Tool, K.O. Lee tool
Van Norman #666 Crankshaft

LATHES
American 12"x30", Bridgeford 36"x20", 32"x16'
Bertram 26"x10'
Boyes & Emmes—24" G.H.—Bradford 16"x36"
Gisholt Simplimatic 18"x16½", 2 Tables
Hendey 12"x42" and 12x30", 1941, 14" Yoke
LeBlond Regal 10"x3' bed, 13x42"
LeBlond 25/50x96" Gap, Late type.
Lipe-Carbo 12"x18" (2)
Lodge & Shipley #3A, Duomatics
Pratt & Whitney 16"x60, 10"x20", 16"x36
Monarch Magna-matic 14"x54"
New 16, 18, 20", 28" Immediate Del.
New Tool Maker 10x24", South Bend 9"
Rivett Model 918 Precision. Mod. 715
Putnam, Sliding Gap 22"/46"x92"
South Bend 13"x5' Q.C.G., 10"x3½ Taper Att.
Sundstrand 8x15", 15' Stub
Wickes 32"x35' Geared Head

MILLS, PLAIN, UNIV. PROD.
New #2, Univ., Dividing Hd.
Brown & Sharpe #0 Omniversal, #000 Production
Brown & Sharpe #2B Plain, No. 2, 3A, 21, #2L
Cinn. 08 Rise & Fall 2-24 Automatic
Cinn. No. 3, 4 Plain Spd., 18" Manufacturing
Kent Owens IV, 1-8, 1-14, 1M, 2-20
Kempsmith #1 Pl., Vert. & Div. Hd.
Milwaukee 2H Universal, 2H Plain
Milwaukee #2B, Plain & Univ.
Sundstrand #00, 0, Rigidmils
Sundstrand #3A Rigidmil with copying Attach, 3J
Van Norman #2L Univ., Dividing Head
(8) Van Normans #12—Hor. vert—Late

MILLS, VERTICAL
Cincinnati (2)—1-18 Plain Automatic
Cincinnati #3, 08 Vertical
Cleveland No. 1 table 8"x32"
Gorton 8D Super Speed
Milwaukee 4K & 2K
Morey #12M Profiler, 2 sp. #2 Maximiller
New Manex 8"x24"
Reed Prentice Vert. Mill & Die Sinker Mod. 3VG
Taylor & Fenn Vert. 6"x18"

PRESSES
Bliss No. 1 Double Action Drawing Presses
Bliss 650 Hi-Production Presses
Bliss 18, 19, 21, OBI, 58, 62, 162, OB
Bliss 4½ Double Action, Roll Feeds, Cam (2)
Bliss #78½, 330 Ton 55, Bliss 74½
Bliss 5-48 Dbl. 32x48" bed, Cushion
Hamilton 850 Ton S.S. Bed 27x48
Hamilton 110 FM Die Tryout Press
New 85, 60, 55, 30, 20, 15, 10, 5 Ton O.B.I.
Niagara Horning, 15 Ton—Toledo 32 Ton Horning
Niagara A1¾, O.B.I., Niagara No. 27
Stokes Tablet Presses, Mod. R, RD3, RD35, DDS.
Toledo 29 Double Action Cam
V. & O. #102 O.B.I. Reducing
Walsh No. 3 O.B.I. 23 Ton, L1 #3
Z & H #4½, O.B.I. 20 Ton

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Brown & Sharpe, #2 Hand, #10, 11
Foster #2B 2½ Cap. Morey #2G Late
Gisholt 2L, Cross Slid. Tur.
Gisholt #5, Bar Feed, Plenty of Tools
Gisholt 4R—9¼" hole in spindles
Jones & Lamson, Mod. 8A
Libby 1 HS with threading att.—3R, 4R
Oster 601 WD. #2 Simmons Microspeed
Warner & Swasey #1, 1A, 2, 2A, 3, 4, 5

MISCELLANEOUS
Band Saw: New Kalamazoo & Johnson
Bending Roll: Reed-Power 5"
Bolt & Pipe Threader: Landis, Oster-Williams
Broach: New 6 Ton. Horizontal. 11 Ton. Vertical
Hacksaw: Peerless 6"x6", Racine 6"x6"
Jig Borers: New Swiss
Keyseater: Davis, Baker
Pipe Bender, Kane & Roach, Parker tube 1½" Cap.
PLANER: Niles-Bement-Pond 36x36'x10'; Gray 24"x24"x8', Detrick & Harvey 40x90"
Rotary Table: Cincinnati, power take-off
Saw: Shaping 6x6", 13x13", Tannewitz Cut Off
Scrap Cutters & Granulator: Bell & Jewell
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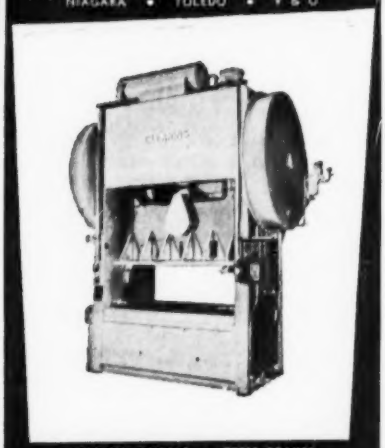

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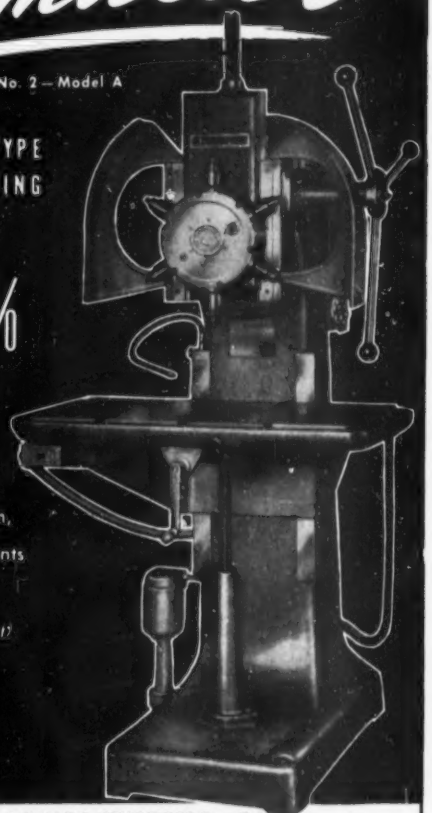

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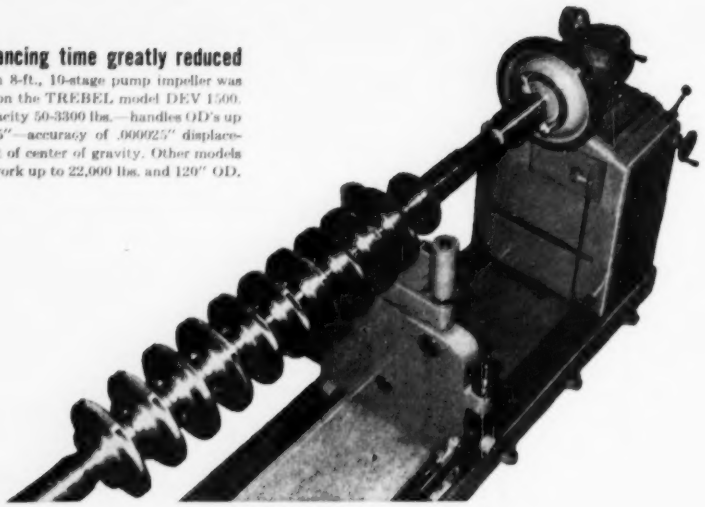

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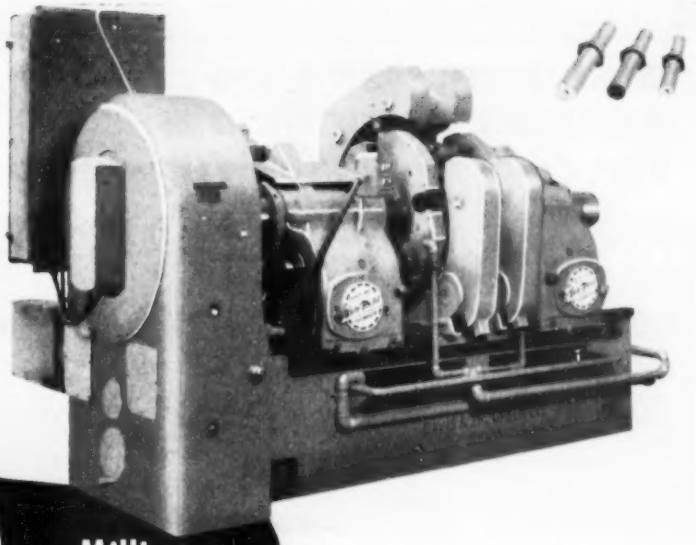

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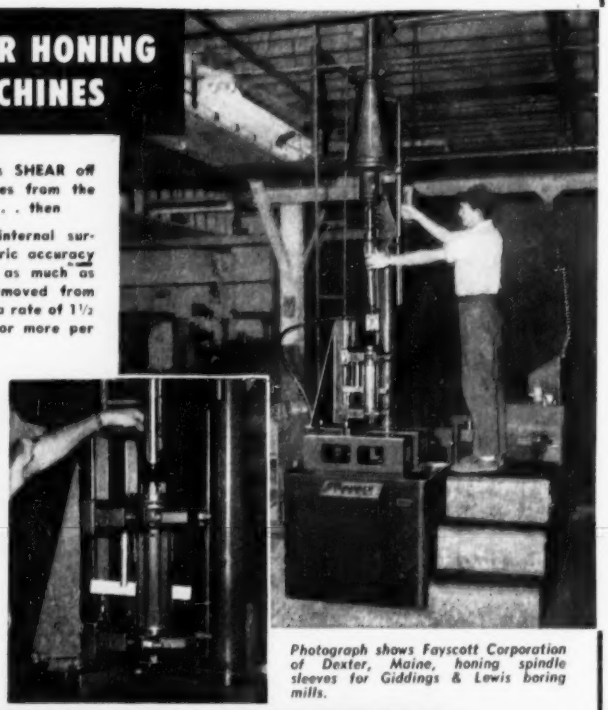

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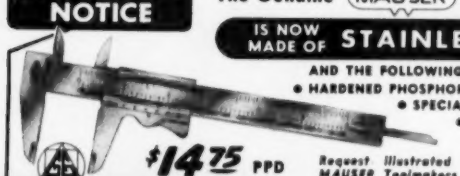

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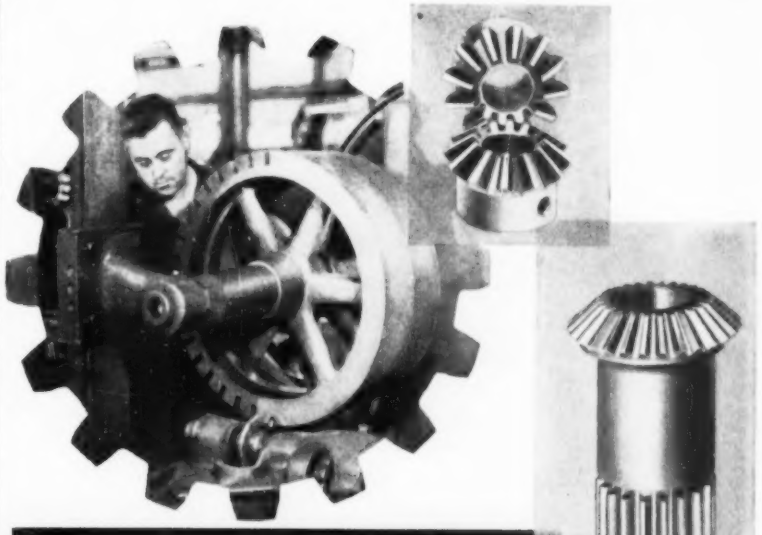

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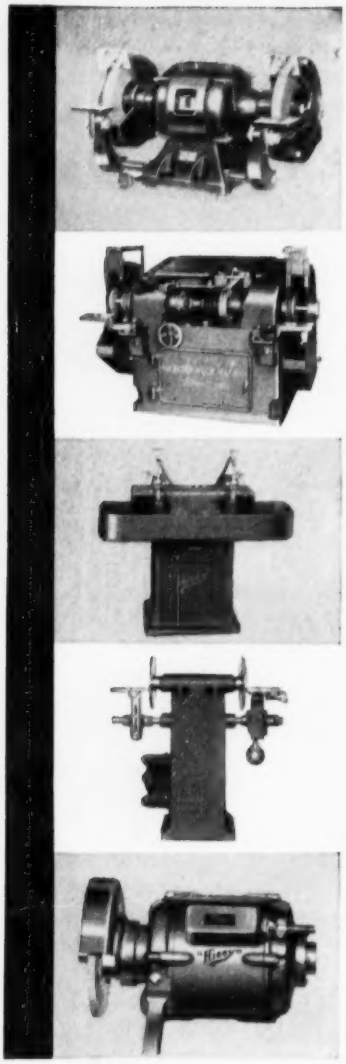

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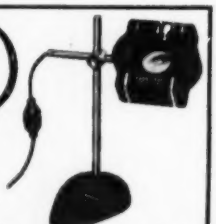

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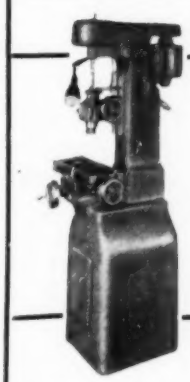

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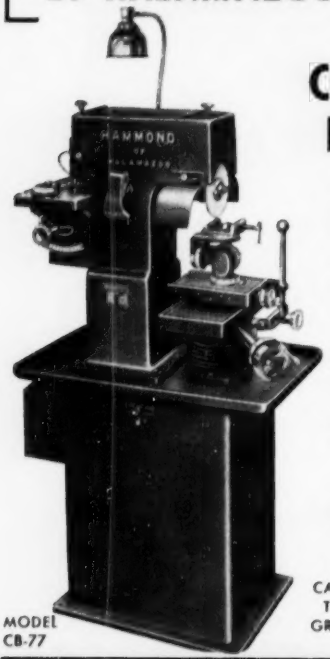

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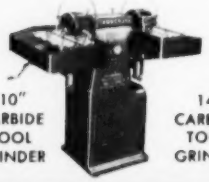

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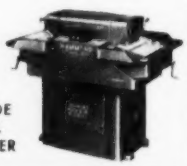

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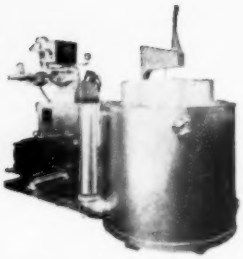
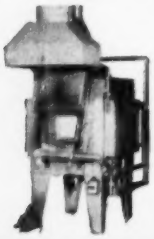
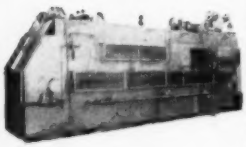




Controlled atmosphere hardening furnace (tool room)



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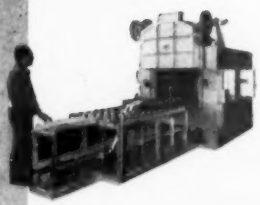
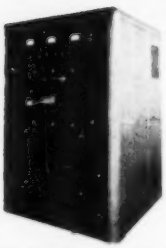
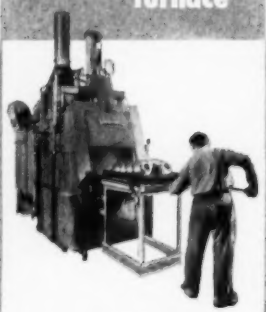


Lindberg-Fisher 2-chamber induction melting and holding furnace

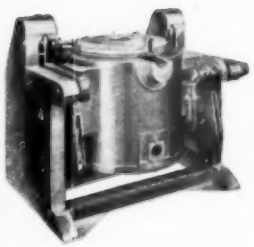


High frequency induction heating unit

Carbonitriding furnace



Fisher melting and holding furnace (gas or oil fired)



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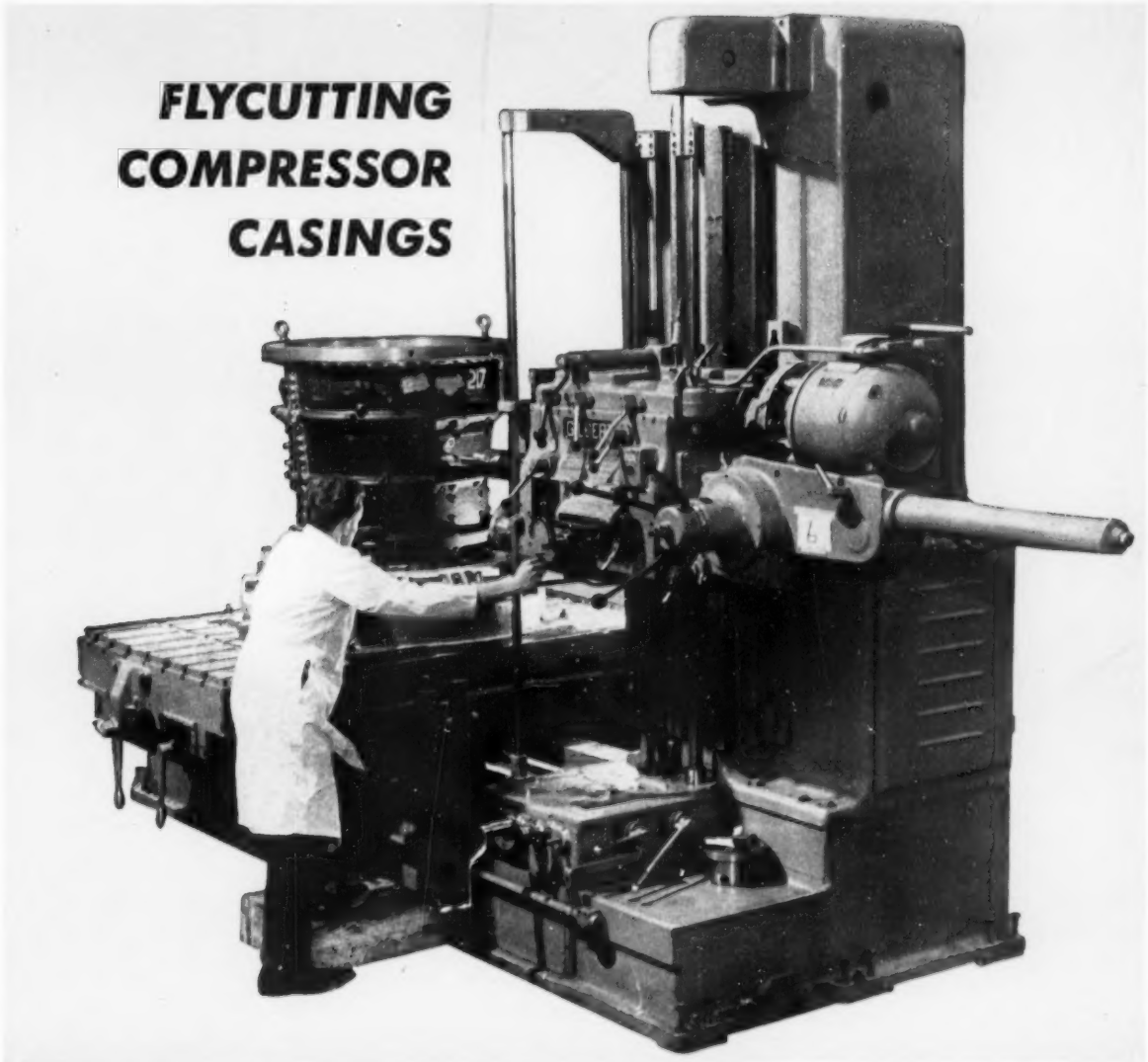

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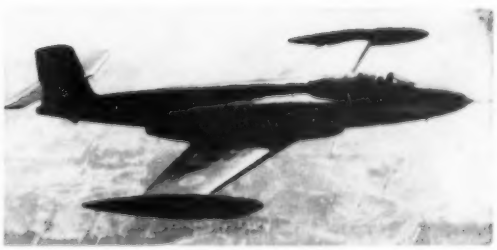

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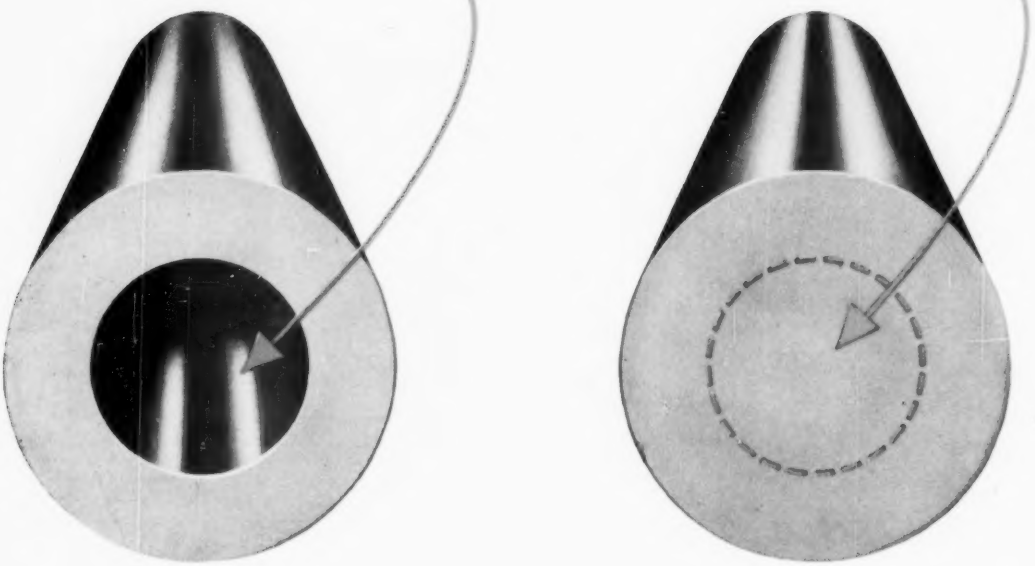

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